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ABSTRACT

Non-commercial investigator-developed tests and other instruments to assess mathematical instruction, reported in journals and dissertations from 1964 through 1973, are listed. For approximately 200 instruments, information on content, format, sample, reliability, correlations, and validity is included, as well as references. Other instruments for which only partial information was available are also cited on a supplementary list. (No instruments are included.) (JP)

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MATHEMATICS EDUCATION REPORTS

Unpublished Instruments for Evaluation in Mathematics Education: An Annotated Listing

by Marilyn N. Suydam

ERIC Information Analysis Center for
Science, Mathematics and Environmental Education
400 Lincoln Tower
The Ohio State University
Columbus, Ohio 43210

January 1974

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Mathematics Education Reports

Mathematics Education Reports are being developed to disseminate information concerning mathematics education documents analyzed at the ERIC Information Analysis Center for Science, Mathematics, and Environmental Education. These reports fall into three broad categories. Research reviews summarize and analyze recent research in specific areas of mathematics education. Resource guides identify and analyze materials and references for use by mathematics teachers at all levels. Special bibliographies announce the availability of documents and review the literature in selected interest areas of mathematics education. Reports in each of these categories may also be targeted for specific sub-populations of the mathematics education community. Priorities for the development of future Mathematics Education Reports are established by the advisory board of the Center, in cooperation with the National Council of Teachers of Mathematics, the Special Interest Group for Research in Mathematics Education, the Conference Board of the Mathematical Sciences, and other professional groups in mathematics education. Individual comments on past Reports and suggestions for future Reports are always welcomed by the editor.

The development of test items and instruments is not only important for educational evaluation, but is a crucial aspect of research in mathematics education. Activity in this area has grown phenomenally in the last ten years. An indirect development of this activity has been the establishment of behavioral objectives and test item collections, or banks. A listing of objective and test item banks relative to mathematics education (and within the ERIC system) can be found in the ERIC/SMEAC publication Evaluation in the Mathematics Classroom: From What and Why to How and Where (SE 017 117).

An additional and previously unexplored source of test items is found in the many research publications and doctoral dissertations produced in mathematics education each year. This document is an attempt to identify tests developed and used in such documents during the last decade, 1964-1973. The document is not a source for the tests themselves-- to examine actual tests and items the reader will need to refer to the original publication, article, or dissertation. This document, however, can be used to identify documents which may contain useful tests in several different areas. It will help researchers, administrators, and teachers drastically shorten their literature searches for tests and test items.

We recognize that this identification of unpublished evaluation instruments is only a beginning step towards the establishment of a new broadly based test item bank. But we hope that as a beginning, it may stimulate further development in this field.

Jon L. Higgins
Editor

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Unpublished Instruments for Evaluation in Mathematics Education: An Annotated Listing

Researchers frequently meet a problem in their design of a study at the point at which they must evaluate the results of the treatments. (Teachers frequently have the same need as they attempt to evaluate a particular aspect of their instructional program.) There are three alternatives: (1) elect to use a standardized instrument, (2) use an instrument someone else has developed for another research study, or (3) develop an instrument specific to the dimensions of the study.

There are times when the first alternative is the most appropriate; e.g., when the scope of content in the treatment is broad and/or there is a need to determine "impact" on a normed basis. There are times when the second alternative is logical; e.g., when the two studies are focused on attainment of the same objectives. Many times the third alternative is the most appropriate, for the objectives are specific to the study and not to any other study.

There are many comments in the literature of mathematics education about the need for careful selection of appropriate instruments. One difficulty is inherent in opting for the second alternative: there is insufficient information on instruments that have been developed by other researchers. The search for an instrument which already might exist often takes longer than the process of developing a new instrument.

This document is an attempt to aid in resolving this difficulty. Presented are summaries of instruments which have been noted in certain research reports in mathematics education. This is intended as a reference: no endorsement of any kind should be implied. Each researcher must ascertain for himself whether an instrument is appropriate for his purposes. The instruments (or, in a few instances, sample items) are (hopefully) available in the references cited: ERIC/SMEAC does not have available copies of these instruments.* It is recognized that it would be of value to have an instrument bank, but this is not feasible at the present time. The primary purpose of this document is to increase awareness of what instruments exist. (It can also lead to identification of areas in which few or no instruments exist, and thus stimulate interest in developing instruments in these areas.)

Scope

Many limitations could be cited; some pertinent factors to consider include:

(1) The sources for the instruments are journal articles, dissertation abstracts (from Dissertation Abstracts and Disser-

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* "Order No." in references for dissertations pertains to the number to be used in ordering a copy of the dissertation from University Microfilms, 300 North Zeeb Road, Ann Arbor, Michigan 48106. (Costs are $4 for microfilm and $10 for Xerography copy.) ERIC documents may be ordered from the Educational Document Reproduction Service, P. O. Drawer 0, Bethesda, Maryland 20014. Specify the ED number. (Costs are $0.65 for microfiche and $3.29 per hundred pages or any part thereof for hard copy.)

tation Abstracts International), and ERIC documents.

(2) In the source, there was a statement or clear implication that the instrument was developed by the investigator. Unless this statement or implication was found, the instrument was not listed; thus, other investigator-developed instruments probably exist.

(3) The presumption has been made that a researcher who cites an investigator-developed instrument in a dissertation abstract has included that instrument in the dissertation. This may not be true; all dissertations were not checked.

(4) The time period is the ten-year period from 1964 through 1973. This seemed feasible in view of the changed and changing scope of the mathematics program.

(5) The instruments were used with a sample of students from kindergarten through grade 12, or with pre-service or in-service teachers at the elementary or secondary school level.

(6) No claim is made for comprehensiveness: omissions may have occurred through error or oversight (e.g., the author of this document simply did not note the pertinent statement re "investigator-developed", or specific information on content, reliability, or other factors might have been overlooked).

(7) These instruments are all related to mathematics education, primarily by content. Non-mathematics-related instruments, even though they were used in a mathematics-related study and were developed by the investigator, were not included

(e.g., an attitude scale on the computer-assisted instruction environment would not be included).

Sequence

The document consists of two parts.

(1) An annotated listing of instruments, presented in alphabetical order by the instrument-developer's last name. The annotation includes:

(a) Title of the instrument. Quotation marks around a title indicate that a test name was not given in the reference, so the title is one assigned by the author of this document.

(b) Developer of the instrument.

(c) Content: what the instrument is designed to measure.

(d) Format: the number and type of items and other pertinent information (as/when specified in reference).

(e) Sample: the number and grade or age level of the students used for determining reliability of the instrument and/or in the study.

(f) Reliability: the statement about or the data pertaining to reliability of the instrument, with the statistical procedure named in some cases.

(g) Correlations: coefficient for or statements about correlations with other instruments.

(h) Validity: statements from the reference that seemed pertinent to the validity of the instrument.

(i) References: the source or alternative sources of information about the instrument.

(2) A supplementary list of instruments. An instrument was included on this list when a dissertation abstract included no specific statement pertaining to reliability and/or validity or when an article included only sample items.

There is a list of references for the second part, but no list of references for the first part: the reference is included with each instrument cited, so a separate list seemed redundant.

There are two indexes. In the first index, the instruments are categorized by type (cognitive, affective, teacher analysis, and research analysis) and by mathematical topic. The level of the sample is noted ("E" denotes elementary; "S", secondary; "C", college; "TE", teacher education). The second index is a list of instrument developers, given alphabetically by level.

Infinity

An attempt will be made to update this document periodically, by (1) correcting information contained in this document, (2) adding further information on instruments cited in this document, (3) adding information on instruments inadvertently omitted at the time this document was being prepared, and (4) adding information on instruments developed after December 1973. To aid in this process, please send comments re corrections and additions to existing materials and/or parallel information on other instruments to:

Marilyn N. Suydam
ERIC/SMEAC
400 Lincoln Tower
The Ohio State University
Columbus, Ohio 43210

Title: *Mathematics-Physics Survey Examination*

Developed by: S. Abeles

Content: physics problems involving use of mathematical skills, similar problems with the appropriate formula following each item, and mathematical problems concerned with skills involved in the solution of the physics problems in the first two sets

Format: three sections

Sample: 387 Regents physics and 313 PSSC physics students in 32 schools

Reliability: not specified in abstract

Correlations: "Correlations between the ability ... to show mastery of the mathematical skills and to solve physic problems involving these skills were significant" (beyond .01 level). Correlation matrixes for Scholastic Aptitude mathematics and verbal scores, Regents Mathematics 10 and 11, Regents Chemistry and Physics, and PSSC final examination scores were developed.

Validity: content validated by five jurors experienced in teaching physics and in Regents and New York State PSSC physics test construction

Reference: Abeles, Sigmund. The Utilization of Certain Mathematical Skills in the Solution of Selected Problems in Physics. (New York University, 1966.) *Dissertation Abstracts* 27A: 2435-2436; February 1967. [Order No. 67-107]

Title: A-V Scales of Attitude Toward Arithmetic

Developed by: S. Adams and R. C. Von Brock

Content: assesses attitude toward mathematics

Format: 35 items, Likert-type scale (available from Library of Congress--address in article)

Sample: First draft of 50 items administered to 122 pre-service elementary school teachers; analyzed, 10 statements eliminated. Revised form (40 items) administered to 101 pre-service elementary school teachers; analyzed, 5 items eliminated. Final form administered to 35 pre-service elementary school teachers.

Reliability: r = .90 (split-half coefficient). Correlation between scores on positive and negative items, .70.

Correlations: not specified in article

Validity: First draft of 50 statements each closely related to a level on Bloom's Taxonomy.

Reference: Adams, Sam and Von Brock, Robert C. The Development of the A-V Scale of Attitudes Toward Mathematics. Journal of Educational Measurement 4: 247-248; Winter 1967.

Title: Self-Perception in School

Developed by: J. M. C. Alberti

Content: assesses self-perception in school among primary grade children

Format: self-report, group-administered, non-verbal inventory; set of 21 cartoon-like drawings

Sample: 656 pupils in grades 1, 2, and 3 in two schools

Reliability: r = .62 to .82 (boys), .49 to .60 (girls) (Kuder-Richardson formula 20); r = .67 to .87 (test-retest, n = 136).

Correlations: significantly related to teachers' ratings of children's behavior and to reading and arithmetic achievement

Validity: Items based on Sarbin's Role Theory. Three pilot studies to assess face validity of the pictures. Validity sample of 30 children individually administered the test and a social desirability scale. Responses to the SPS on the group and individual testing correlated as a measure of convergent validity; correlation not significant. Social desirability scores not correlated significantly with SPS scores. Found to be multi-dimensional, but no observable tendency for items to cluster in definable patterns for the various grade/sex groups.

Reference: Alberti, Jean Mae C. Self-Perception-in-School: Validation of an Instrument and a Study of the Structure of Children's Self-Perception-in-School and Its Relationship to School Achievement, Behavior, and Popularity. (State University of New York at Buffalo, 1970.) Dissertation Abstracts International 31A: 4535-4536; March 1971. [Order No. 71-6048]

Title: *Appalachia Preschool Mathematics Test*

Developed by: R. W. Alford, Jr.

Content: items derived from those behavioral objectives which related to mathematical concepts in the Appalachia Preschool Education Program

Format: 48 items

Sample: 121 children aged 3 to 5

Reliability: r = .85 (Spearman-Brown formula)

Correlations: not specified in abstract

Validity: curriculum-specific items

Reference: Alford, Roy W., Jr. Teaching Mathematical Concepts to Rural Preschool Children Through a Home-Oriented Program. (University of Virginia, 1970.) *Dissertation Abstracts International* 31A: 4373-4374; March 1971. [Order No. 70-26,616]

Alford, Roy W., Jr. Teaching Mathematical Concepts to Rural Preschool Children Through a Home-Oriented Program. Charleston, West Virginia: Appalachia Educational Laboratory, 1970. ERIC: ED 063 992. 168 pages. (dissertation)

Title: *Mathematics Concept Test*

Developed by: J. H. Ames

Content: basic strands of mathematics for the elementary school curriculum

Format: 58 items

Sample: 150 pre-service elementary teachers in methods course

Reliability: not specified in abstract

Correlations: not specified in abstract

Validity: Each concept tested was contained in the state-adopted textbook in mathematics for grades K-6.

Reference: Ames, John H. An Evaluation of Mathematics Concepts of Prospective Elementary Teachers at California State College Long Beach. (University of California, Los Angeles, 1971.) *Dissertation Abstracts International* 32A: 3830; January 1972. [Order No. 72-2769]

Title: "Mathematics Attitude Scale"

Developed by: R. G. Anttonen from scale by Hoyt

Content: assesses attitude toward mathematics

Format: 94 items from a mathematics opinion questionnaire developed by Hoyt arranged into 15 Guttman-type scales for scoring by a developed method

Sample: 607 students in grades 5 and 6 (1960) and grades 11 and 12 (1966): six-year longitudinal study

Reliability: "consistent and reliable scoring procedure at both grade levels": r = .95 (elementary) and .96 (secondary)

Correlations: Elementary attitude score with secondary attitude score, .31; with Arithmetic Total of the Iowa Tests of Basic Skills, .22; with mathematics grade point average, .31. Secondary attitude score with the Quantitative Thinking subscore of the Iowa Tests of Educational Development, .40; with mathematics grade point average, .43. (The two achievement test scores were correlated, .80.) Correlations for eleventh- and twelfth-grade boys and girls separately also presented in article.

Validity: Items developed by Hoyt; "cross-validated at both the elementary and secondary levels; see "Correlations"

Reference: Anttonen, Ralph George. An Examination into the Stability of Mathematics Attitude and Its Relationship to Mathematics Achievement From Elementary to Secondary School Level. (University of Minnesota, 1967.) Dissertation Abstracts 28A: 3011-3012; February 1968. [Order No. 68-1521]

Anttonen, Ralph G. A Longitudinal Study in Mathematics Attitude. Journal of Educational Research 62: 467-471; July/August 1969.

Title: "Posttest on Multiplication with Fractions"

Developed by: C. L. Arvin

Content: measures achievement on multiplication with fractions

Format: 34 items

Sample: 325 pupils in grade 6

Reliability: "A pilot study was conducted with 69 seventh grade pupils to help determine the reliability of the criterion test."

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Arvin, Charles Lee. An Experimental Study of Programed Instruction in Multiplication of Fractions (Research Study No. 1). (Colorado State College, 1965.) *Dissertation Abstracts* 26: 7109; June 1966. [Order No. 66-5983]

Title: *A Test of Understandings of Selected Properties of a Number System: Primary Form*

Developed by: R. B. Ashlock

Content: measures understanding of selected properties of a number system--Part I, one-to-one correspondence, cardinal and ordinal number concepts, recognition of numerals; Part II, decimal place value; and Part iii, properties of addition on whole numbers

Format: 46 multiple-choice items. Three parts, each administered in a separate session; Part I, 17 items; Part II, 16 items; Part III, 13 items. Paper-and-pencil, with directions for each item read orally by test administrator; no computation necessary. (Sample items in article (2); test included in article (3).)

Sample: First form, 64 items, administered to 52 first- and 55 second-graders; revised after item analysis. Second form, 45 items, administered to 60 first- and 57 second-graders; revised. Third form, 46 items, administered to 136 first- and 110 second-graders; revised. Final form administered to 248 first graders and 242 second graders (n = 490).

Reliability: Third form, r = .90. Final form, r = .86, whole test; .73, Part I; .81, Part II; .58, Part III (Froelich formula). Item analysis indicated discrimination between high and low scorers.

Correlations: not specified in abstract or articles

Validity: panel of five experts agreed that "the test had a relatively high degree of validity, though limitations were noted for certain items"

References: (1) Ashlock, Robert B. A Test of Understandings of Selected Properties of a Number System: Primary Form. (Indiana University, 1965.) *Dissertation Abstracts* 27A: 321-322; August 1966. [Order No. 66-3100]

(2) Ashlock, Robert B. A Test of Understandings for the Primary Grades. *Arithmetic Teacher* 15: 438-441; May 1968.

(3) Ashlock, Robert B. and Welch, Ronald C. A Test of Understandings of Selected Properties of a Number System. *Indiana University School of Education Bulletin* 42: 1-74; March 1966.

Title: *Survey Instrument: Geometry Test and Teaching Geometry Test*

Developed by: C. A. Backman

Content: assesses elementary teacher's knowledge of geometry and knowledge of problems of teaching geometry in the elementary school

Format: not specified in abstract

Sample: 65 elementary and middle school teachers in one school

Reliability: not specified in abstract

Correlations: Correlations between the tests and two attitude concepts ranged from .41 to .76. Correlations between test scores of teachers, type of questioning used in the classroom, and student test scores noted.

Validity: not specified in abstract

Reference: Backman, Carl Adolph. A Study of Teacher Characteristics Related to Teaching Geometry in the Elementary School. (Syracuse University, 1969.) *Dissertation Abstracts International* 31A: 258-259; July 1970. [Order No. 70-12,765]

Title:	*Baker Diagnostic Scales*
Developed by:	B. L. Baker
Content:	measures confidence, interest, and achievement for a self-selection-of-learning-activities program in mathematics
Format:	not specified in abstract
Sample:	72 students in 6 classes of ninth-grade pre-algebra mathematics in two schools
Reliability:	not specified in abstract
Correlations:	positive correlations (r = .18 to .63) between confidence and achievement scores
Validity:	not specified in abstract
Reference:	Baker, Betty Louise. A Study of the Effects of Student Choice of Learning Activities on Achievement in Ninth Grade Pre-Algebra Mathematics. (Northwestern University, 1971.) *Dissertation Abstracts International* 32A: 2895; December 1971. [Order No. 71-30,735]

Title: "Knowledge of Elementary School Geometry Concepts"

Developed by: M. N. B. Banning

Content: assesses attainment of geometry concepts by pre-service elementary school teachers

Format: 29 items

Sample: pre-service elementary school teachers taking geometry courses

Reliability: "Confirmation of its validity, reliability, and discrimination formed an important part of the study."

Correlations: not specified in abstract

Validity: "based on detailed analysis of the geometry of four widely-recognized text series"

Reference: Banning, Margaret Neoma Botkin. The Preparation of Prospective Teachers in the Geometry Content of Elementary School Mathematics Texts. (Montana State University, 1971.) Dissertation Abstracts International 32B: 5300; March 1972. [Order No. 72-8875]

Title: "Mathematics Classroom Activity Rating Scale"

Developed by: E. V. Bartel

Content: assesses classroom interaction with focus on learning rather than teaching

Format: five-point rating scale, 20 items (items included in article)

Sample: 31 in-service elementary teachers

Reliability: correlation of instructor's rank order with scores on rating scale, .90; correlation of class average rank order with class average scores on rating scale, .95 (both significant beyond .001 level)

Correlations: not specified in article

Validity: a group of classroom teachers who taught mathematics agreed that the twenty statements in the scale "could adequately serve as the basis for evaluating a classroom mathematics activity"

Reference: Bartel, Elaine V. Supervision in Mathematics. Arithmetic Teacher 20: 24-26; January 1973.

Title: "*Test on Mathematical Concepts*"

Developed by: O. C. Bassler

Content: assesses "achievement in teaching mathematical concepts"

Format: 60 multiple-choice items: 45 "theory" items and 15 "applied" items

Sample: 2 classes of pre-service elementary school teachers

Reliability: coefficients ranged from .72 to .81 (split-halves method)

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Bassler, Otto Call. A Comparison of Two Types of Exercises in Teaching Mathematical Concepts to Prospective Elementary School Teachers. (University of Maryland, 1966.) *Dissertation Abstracts* 27A: 978; October 1966. [Order No. 66-9272]

Title: "Test on Exponential Notation"

Developed by: R. B. Bausell, W. B. Moody, and F. N. Walzl

Content: measures achievement on each of eight instructional objectives for an elementary unit on exponential notation

Format: 16 items: two items designed to measure each objective (Three objectives cited in article.)

Sample: 120 pupils in 20 fourth- and fifth-grade classes

Reliability: r = .84 (split-half, Spearman-Brown formula)

Correlations: Posttest correlated .55 with PMA IQ scores.

Validity: see "Content"

Reference: Bausell, R. Barker; Moody, William B.; and Walzl, F. Neil. A Factorial Study of Tutoring Versus Classroom Instruction. American Educational Research Journal 9: 591-597; Fall 1972.

Title: Knowledge of Mathematics,
Knowledge of Aspects of Teaching Elementary School Mathematics,
Attitude Toward Teaching Elementary School Mathematics

Developed by: J. E. Beamer

Content: measures knowledge of mathematical content, methodology, and attitudes of teachers (three tests)

Format: not specified in abstract

Sample: experienced elementary school teachers in a graduate mathematics education course

Reliability: for the three instruments, r = .93, .75, .90 (split-half method)

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Beamer, James Edward. A Model for the Evaluation of Educational Projects. (The University of Nebraska, 1971.) Dissertation Abstracts International 32A: 2295; November 1971. [Order No. 71-28,596]

Title: "Transfer Test on Problems with Fractions"

Developed by: R. H. Beamer

Content: measures transfer on problems on multiplication with fractions, with some items on addition and subtraction with fractions

Format: 20 story problems

Sample: 96 pupils in grade 5

Reliability: r = .93 (Kuder-Richardson formula 20)

Correlations: not specified in abstract or article

Validity: not specified in abstract or article

References: Beamer, Robert H. and Lemke, Elmer A. Effects on Transfer of Training of Constant Versus Varied Training, Group Size, and Ability Level, in Elementary Mathematics. Journal for Research in Mathematics Education 44: 20-25; January 1973.

Beamer, Robert Harlan. Transfer After Training with Single vs. Multiple Tasks by Individuals and Pairs of Low and High Ability Fifth Graders. (Illinois State University, 1970.) Dissertation Abstracts International 31A: 2730; December 1970. [Order No. 70-23,652]

Title: *"Tests on Equivalent Fractions"*

Developed by: E. C. Beardslee and G. E. Gau

Content: assesses knowledge of equivalent fractions

Format: pretest, 18 questions--6 questions testing each of three hierarchical instructional objectives; posttests, generalization tests (sample items included in article)

Sample: pretest, 202 pupils in grades 5 and 6; other tests, 83 pupils in grades 5 and 6

Reliability: not specified in article or abstracts

Correlations: not specified in article or abstracts

Validity: all tests criterion-referenced, written to very specific behavioral objectives

References: Beardslee, Edward C.; Gau, Gerald E.; and Heimer, Ralph T. Teaching for Generalization: An Array Approach to Equivalent Fractions. *Arithmetic Teacher* 20: 591-599; November 1973.

Beardslee, Edward Clarke. Toward a Theory of Sequencing: Study 1-7: An Exploration of the Effect of Instructional Sequences Involving Enactive and Iconic Embodiments on the Ability to Generalize. (The Pennsylvania State University, 1972.) *Dissertation Abstracts International* 33A: 6721; June 1973. [Order No. 73-13,953]

Gau, Gerald Elmer. Toward a Theory of Sequencing: Study 1-6: An Exploration of the Effect of Instructional Sequences Involving Enactive and Iconic Embodiments on the Attainment of Concepts Embodied Symbolically. (The Pennsylvania State University, 1972.) *Dissertation Abstracts International* 33A: 6728; June 1973. [Order No. 73-13,980]

Title: *Test on ALGEB-Form II* [Algebra]

Developed by: E. C. Beardslee and L. C. Jansson

Content: assesses achievement in ninth-grade algebra

Format: 33 multiple-choice items; paper-and-pencil

Sample: 457 students in grade 9 algebra classes

Reliability: r = .30 to .62 (pretest), .68 to .79 (posttest)

Correlations: significant correlation with previous achievement found for three of four groups

Validity: developed to assess objectives of a year-long computer-assisted instruction course (ALGEB) as well as the non-CAI version

Reference: Mitzel, Harold E.; Hall, Keith A.; Suydam, Marilyn N.; Jansson, Lars C.; and Igo, Robert V. *A Commonwealth Consortium to Develop, Implement and Evaluate a Pilot Program of Computer-Assisted Instruction for Urban High Schools*, Final Report. University Park, Pennsylvania: The Pennsylvania State University, 1971. ED 059 604. 232 pages.

Title: "Arithmetic Tests for Bengali Medium Schools" (Pakistan)

Developed by: K. Begum

Content: measures achievement in Classes I-V (Pakistan) on the basis of objectives and syllabus prescribed by the curriculum committee

Format: Classes I-II, multiple-choice, matching, and short-answer items; Classes III-V, multiple-choice. Number of items for Classes I-V, 37, 43, 40, 44, 44. Percentile norms determined.

Sample: Pilot test with 344 students in three Bengali schools; tests revised and items reduced from 50-56 to 37-44. Administered to 1913 students in 18 Bengali schools.

Reliability: Pilot tests, r = .69, .74, .90, .81, .83 (by class), with difficulty and discrimination indices of .16 to .84. Final forms, r = .88, .92, .80, .84, .82 (by class), with difficulty and discrimination indices of .16 to .84. (All r's statistically significant.)

Correlations: not specified in abstract

Validity: Content validity determined by judges' rating of items; found "very satisfactory". Validity coefficients were .70, .50, .38, .40, .42 (by class); statistically significant.

Reference: Begum, Kamrunnessa. The Construction of Objective Achievement Tests in Arithmetic for Classes One Through Five in Bengali Medium Schools in Dacca, Pakistan. (Colorado State College, 1969.) *Dissertation Abstracts International* 30A: 4299-4300; April 1970. [Order No. 70-7101]

Title: "Test on Geometric Sections"

Developed by: B. L. Boe

Content: assesses ability of secondary school students to perceive the plane sections of selected geometric solid figures

Format: 16 sectioning tasks: Test I, students have to draw boundary of section; Test II, identification of boundary through multiple-choice items. Individually administered, orally. Tasks illustrated in article.

Sample: First pilot study, pupils in grades 1, 4, 6, 8, and 10; vocabulary revised. Second pilot study provided information on response items of Test II; revised. Final form administered to 72 students in grades 8, 10, and 12 in five schools.

Reliability: r = .55 for two methods of response (Pearson product-moment correlation coefficient)

Correlations: not specified in article or abstract

Validity: not specified; discussed in relation to Piaget's findings

References: Boe, Barbara L. A Study of the Ability of Secondary School Pupils to Perceive the Plane Sections of Selected Solid Figures. Mathematics Teacher 61: 415-421; April 1968.

Boe, Barbara Lamphere. A Study of the Ability of Secondary School Pupils to Perceive the Plane Sections of Selected Solid Figures. (The University of Wisconsin, 1966.) Dissertation Abstracts 28A: 387; August 1967. [Order No. 66-13,399]

Boe, Barbara Lamphere. Secondary School Pupils' Perception of the Plane Sections of Selected Solid Figures. Technical Report No. 13. Madison: Research and Development Center for Learning and Re-education, 1966. ED 010 515. 43 pages.

Title: "*Addition Problems Test*"

Developed by: E. J. Bolduc, Jr.

Content: measures ability to solve addition problems

Format: 12 addition word problems, five "distractor" items (pictorial presentation, students asked to construct problems), 1 introductory problem; read to students

Sample: 36 pupils in grade 1 in three schools

Reliability: r = .65 (Kuder-Richardson formula 20)

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Bolduc, Elroy Joseph, Jr. A Factorial Study of the Effects of Three Variables on the Ability of First-Grade Children to Solve Arithmetic Addition Problems. (The University of Tennessee, 1969.) *Dissertation Abstracts International* 30A: 3358; February 1970. [Order No. 70-2094]

Title: Seriation Skills Test

Developed by: L. A. Bonney

Content: measures seriation skills

Format: four subtests yielding scores reflecting a learner's skill in performing the task of seriation with each of four types of content (concrete, verbal, quantitative, and interpersonal)

Sample: 65 first-grade pupils

Reliability: not specified in abstract

Correlations: Intercorrelations between ability to seriate different types of content: concrete-quantitative, concrete-interpersonal, concrete-verbal, quantitative-interpersonal, quantitative-verbal, interpersonal-berbal ("considered indices to the extent to which seriation skills generalize"). Predominantly low pretest correlations, altered by instructional intervention.

Validity: not specified in abstract

Reference: Bonney, Lewis Alfred. Relationships Between Content Experience and the Development of Seriation Skills in First Grade Children. (University of Arizona, 1970.) Dissertation Abstracts International 31A: 2167; November 1970. [Order No. 70-22,311]

Title: *Self-Estimate of Ability to Do School Work Scale*

Developed by: C. W. Bowen

Content: assesses individual's estimate of his ability to do school work

Format: not specified in abstract

Sample: 389 ninth-grade students in three school systems

Reliability: not specified in abstract

Correlations: Pearson correlation coefficients computed for the relationships existing between self-estimates of ability and grade point average (r = .64; range, .47 to .72), between Differential Aptitude Tests (Verbal Reasoning and Numerical Ability subtests) and grade point average (r = .72), and between scores on the two measuring instruments (r = .51; range, .29 to .63).

Validity: Based on self-concept theory and previous research on the use of self-estimates of ability. To determine the capacity of self-estimates of ability to extend the predictive validity of a representative standard test of academic aptitude, scores from both instruments were used in multiple correlation to predict grade point average (r = .79; range, .76 to .82; accounts for 57% to 67% of the variance in the criterion).

Reference: Bowen, Collin Weldon. The Use of Self-Estimates of Ability and Measures of Ability in the Prediction of Academic Performance. (Oklahoma State University, 1968.) *Dissertation Abstracts International* 30A: 978; September 1969. [Order No. 69-14,219]

Title: *"Tests for 'Structured' and 'Wff'n Proof' Approaches to Logic"*

Developed by: J. J. Bowen

Content: assesses attainment of mathematical logic acquired in two instructional approaches

Format: not specified in abstract

Sample: three classes of fourth-grade honor students in one school

Reliability: Checked using eighth-grade students before study began. Correlation of .99 found on the "Structured" test, pre-and-post-study administrations. r = .87 between the two forms of the "Structured" tests; r = .86 for the "Wff'n Proof" forms

Correlations: see "Reliability"

Validity: items "screened against the content and objectives" of the study

Reference: Bowen, James Joseph. The Use of Games as an Instructional Media. (University of California, Los Angeles, 1969.) *Dissertation Abstracts International* 30A: 3358-3359; February 1970. [Order No. 70-2189]

Title: "Diagnostic Test in Verbal Arithmetic Problem Solving"

Developed by: J. M. Boyden

Content: twelve error categories, including selecting the wrong operation, computation, focusing upon numbers rather than concepts, failing to finish a two-step problem, poor mastery of measurement concepts, and insufficient knowledge of vocabulary or number facts

Format: multiple-choice, with most-common responses given on a survey test used as alternative choices; computer-scored; diagnostic

Sample: 993 pupils in grade 5 administered initial survey in a free-response form; *n* for computer-scored test unspecified

Reliability: for five survey tests, r = .73 to .85, with point-biserial item correlation coefficients from .00 to .74 (Kuder-Richardson formula 20); for computer-scored test, r = .80, with point-biserials from .33 to .63

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Boyden, Joanne Marie. Construction of a Diagnostic Test in Verbal Arithmetic Problem Solving at the Fifth Grade Level. (University of Miami, 1970.) *Dissertation Abstracts International* 31A: 1504; October 1970. [Order No. 70-18,161]

Title: "Unit Tests in Mathematics: Grades 7 and 8"

Developed by: D. P. T. Brinke

Content: varied, based on mathematics homework assignments

Format: five unit tests

Sample: 108 students in grades 7 and 8

Reliability: "The tests satisfied criteria of reliability (as shown by the Spearman-Brown prophecy r), of discrimination of items, and of difficulty of items."

Correlations: see "Validity"

Validity: "The teacher-constructed tests were validated as measures of instruction by correlation with related parts of the Iowa Every-Pupil Test D."

Reference: Brinke, Dirk Pieter Ten. Homework: An Experimental Evaluation of the Effect on Achievement in Mathematics in Grades Seven and Eight. (University of Minnesota, 1964.) Dissertation Abstracts 27A: 4176; June 1967. [Order No. 65-15,326]

Title: "*Reading Comprehension Test of Mathematical Exposition*"

Developed by: R. B. Brunner

Content: Consists of a topology test and an algebra test, for topics treated in upper level undergraduate and graduate mathematics courses. Comprehension defined in terms of eight overlapping abilities, including recognizing 'same form' of a definition, reasoning from a definition, understanding the use of variables, recognizing unfulfilled conditions, and following the development of a proof.

Format: reading selections plus 58 items classified in terms of a point of sequential development in the exposition and also with respect to behavioral objectives, syntactic form, and composite abilities

Sample: 589 students from grade 7 through graduate student level (519 junior and senior high school students from seven states, 70 undergraduate and graduate students)

Reliability: for three samples, r = .60, .85, .89; topology and algebra tests, r = .63 (coefficient alpha)

Correlations: not specified in abstract

Validity: "All 14 hypotheses concerned with validation of the construct and of the experimental measuring instrument were confirmed, the first five with strong evidence. Data indicated that the experimental measuring instrument was more than an intelligence test or a general reading test."

Reference: Brunner, Regina Baron. The Construction and Construct Validation of a Reading Comprehension Test of Mathematical Exposition. (Syracuse University, 1971.) *Dissertation Abstracts International* 32A: 4235-4236; February 1972. [Order No. 72-6559]

Title: "*Measure of the Familiarity of Mathematical Terms and Symbols*"

Developed by: M. A. Byrne

Content: obtains rating on familiarity of 1165 mathematical terms and 153 mathematical symbols that had been found in pre-calculus mathematical materials

Format: student responds "know" or "do not know" for mathematical terms; student gives evidence of knowing a mathematical symbol by writing something correct about the symbol

Sample: 5575 students in grades 7 and 8 from 36 schools

Reliability: "A test-retest estimate of reliability using the responses of 177 seventh and eighth grade students indicated that the familiarity scores for terms were consistent over two different administrations of the tests to the same students... A product-moment correlation coefficient between familiarity scores for symbols using the data from two separate samples of students indicated that the familiarity scores were consistent across different samples of respondents."

Correlations: not specified in abstract

Validity: "The methods of sampling terms, symbols, and students argues for the content validity of the measuring instruments... Evidence of the sensitivity and consistency with which the measuring instruments scored the terms and symbols further contributes to the content validity of the instruments."

Reference: Byrne, Mary Ann. The Development of a Measure of the Familiarity of Mathematical Terms and Symbols. (Purdue University, 1970.) *Dissertation Abstracts International* 31A: 5222-5223; April 1971. [Order No. 71-7050]

Title: *Tests of Professional Knowledge and Mathematical Knowledge*

Developed by: L. G. Callahan

Content: measures knowledge about mathematics education in the elementary schools possessed by teachers in training and in service

Format: not specified in abstract

Sample: pre- and in-service elementary school teachers

Reliability: "An analysis of both testing instruments was carried out. Technical data on the two tests were presented and discussed in the study."

Correlations: Correlations between test scores and "pertinent factors" obtained on a questionnaire--number of courses taken in foundations of education positively correlated with scores on the Professional Knowledge Test for seniors; small negative correlation between grade level taught by in-service teachers and scores on Professional Knowledge Test; negative correlation between scores on both instruments and number of years of teaching experience.

Validity: see "Reliability"

Reference: Callahan, Leroy G. A Study of Knowledge Possessed by Elementary School Teachers, In-Service and In-Training, of the Cultural, Psychological, and Mathematical Foundations of the Elementary School Mathematics Program. (Syracuse University, 1966.) *Dissertation Abstracts* 27A: 4149-4150; June 1967. [Order No. 67-7108]

Title: *Mathematics Concepts Test*

Developed by: W. L. Campbell

Content: measures mathematical understandings of prospective elementary school teachers

Format: 50 items

Sample: 134 students in a mathematics course for elementary school teachers

Reliability: not specified in abstract

Correlations: High correlations found between attitude toward mathematics (Aiken-Dreger attitude opinionnaire) and achievement on Concepts Test; r = .58 (pretest), .62 (posttest)

Validity: 24 basic items from a test constructed and used by Melvin Withnell in a 1967 study

Reference: Campbell, William Lester. A Study of the Effectiveness of Supplementing a Mathematics Course for Prospective Elementary Teachers with Materials from Elementary School Mathematics Series. (The University of Michigan, 1970.) *Dissertation Abstracts International* 31A: 6448; June 1971. [Order No. 71-15,110]

Title: "Test for Analytical Cognition of Mathematical Content"

Developed by: J. S. Cangelosi

Content: measures nine cognitive behaviors indicative of analysis of mathematical content, for students who have completed at least a two-semester course in secondary school algebra

Format: 40 items, multiple-choice

Sample: Pilot study in which 60 of initial set of 91 items were administered by two trial tests. The more discriminating items in each of the nine categories were chosen for the final test, which was administered to 106 students in an algebra II course.

Reliability: r = .90 (Kuder-Richardson formula 20); 34 items had indices of discrimination above .40

Correlations: not specified in abstract

Validity: Eight judges, "all recognized experts in mathematics education", judged items to be valid indicators of analytical behavior.

Reference: Cangelosi, James S. The Construction and Refinement of a Test for Analytical Cognition of Mathematical Content. (The Louisiana State University and Agricultural and Mechanical College, 1972.) *Dissertation Abstracts International* 33A: 2233; November 1972. [Order No. 72-28330]

Title: "Test for 'Sesame Street' Goals"

Developed by: M. A. Carrico

Content: measures recognition and use of reading symbols, recognition and use of numerical symbols, knowledge of geometric forms; body parts, cognitive skills

Format: 5 subtests, composite scores

Sample: 20 kindergarten pupils

Reliability: r = .87 (test-retest)

Correlations: not specified in abstract

Validity: "designed from the behavioral goals of 'Sesame Street'"

Reference: Carrico, Mark Andrew. An Assessment of the Children's Television Program "Sesame Street" in Relation to the Attainment of the Program's Goals by Kindergarten Children in the Sioux Falls, South Dakota Public Schools. (University of South Dakota, 1971.) Dissertation Abstracts International 32A: 2297; November 1971. [Order No. 71-27,813]

Title: "*Test on Integers*"

Developed by: L. J. Chatterley

Content: measures achievement on integers and operations of addition and subtraction over a subset of integers containing three or less digits

Format: 40 items

Sample: seventh-grade students

Reliability: r = .93 (Kuder-Richardson formula 21)

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Chatterley, Louis Joseph. A Comparison of Selected Modes of Individualized Instruction in Mathematics for Effectiveness and Efficiency. (The University of Texas at Austin, 1972.) *Dissertation Abstracts International* 33A: 4663-4664; March 1973. [Order No. 73-7532]

Title: *Beliefs About Mathematics Scale*; *Beliefs About Mathematics Instruction Scale*

Developed by: C. P. Collier

Content: assesses prospective teacher's beliefs about mathematics and instruction in mathematics

Format: two 20-item Likert-type scales (items listed in article)

Sample: 80 initial items pilot-tested using 200 students in elementary education at four stages of mathematical preparation; item analysis used to select final items

Reliability: BAMS, r = .80; BAMIS, r = .83 (AOV internal consistency)

Correlations: not specified in article or abstract

Validity: panel of judges selected 80 initial items from an item pool

References: Collier, Charles Patrick. The Formal-Informal Dimensions of Attitude Toward Mathematics and Mathematics Instruction of Prospective Elementary Teachers. (University of Wisconsin, 1969.) *Dissertation Abstracts International* 31A: 660-661; August 1970. [Order No. 70-3502]

Collier, C. Patrick. Prospective Elementary Teachers' Intensity and Ambivalence of Beliefs About Mathematics and Mathematics Instruction. *Journal for Research in Mathematics Education* 3: 155-163; May 1972.

Title: "*Affective Taxonomy-type Instrument: Mathematics Education*"

Developed by: R. D. Connelly

Content: assesses affective behavioral objectives for a mathematics methods course

Format: Likert-type scale

Sample: 146 pre-service elementary teachers

Reliability: pretest, r = .91; posttest, r = .94

Correlations: Significantly correlated with Dutton Attitude Scale (r = .67). "Factor analysis of the items classified at each taxonomic level seemed to reflect the general affective objectives of the course to a high degree." Coefficient of reproducibility for scales of items on general objectives of the course ranged from .88 to .91 on the pretest and .89 to .94 on the posttest (Guttman scale analysis). Insignificant correlations were obtained between scores on the instrument and overall grade point average and achievement in the course.

Validity: based on Affective Taxonomy rationale and affective behavioral objectives for the course

Reference: Connelly, Ralph D. A Taxonomic Approach to the Evaluation of Attitudes of Prospective Elementary Teachers in a Mathematics Education Course. (Kent State University, 1972.) *Dissertation Abstracts International* 34A: 613-614; August 1973. [Order No. 73-13,303]

Title: *Individual Arithmetic Achievement Test for Educable Mentally Retarded Children Ranging in Ages Thirteen Through Sixteen*

Developed by: A. J. Connolly

Content: assesses arithmetic ability of educable mentally retarded children aged 13 through 16

Format: 97 items (after final revision); organized in subtests; individually administered; requires little reading or writing

Sample: Preliminary 115-item instrument administered to 45 retarded children; results evaluated. "Final" form of 112 items administered to 400 students aged 13-16 in special classes in 12 school districts in eight states, and to 28 normal pupils in grade 5.

Reliability: r = .97 (Pearson Product-Moment test-retest coefficient; r = .97 (Pearson r adjusted by Spearman-Brown formula)

Correlations: for normal pupils, correlated with Iowa Test of Basic Skills: r = .38 for total scores and r = .69 for reasoning scores

Validity: panel of judges approved initial 115 items

Reference: Connolly, Austin Jay. An Instrument of Measurement to Appraise the Arithmetic Abilities of Educable Mentally Retarded Children Ages Thirteen Through Sixteen. (Colorado State College, 1968.) *Dissertation Abstracts* 29A: 1034; October 1968. [Order No. 68-14,719]

Title: *Tests of the Real Number System and Its Subsystems*

Developed by: W. P. Copley

Content: certain mathematical concepts of the real number system and its subsystems, recommended by the Committee on the Undergraduate Program in Mathematics (CUPM)--sets, whole numbers, real numbers, rational numbers, elementary number theory

Format: 40 items on each of five subtests; composite score; multiple-choice items; 50-minute testing periods; raw scores converted to percentile ranks

Sample: Pilot-tested with 164 elementary education majors to determine difficulty and discrimination of items. Final form administered to 5505 elementary education majors who had successfully completed the equivalent of the pertinent CUPM recommendations.

Reliability: Pilot tests, r = .92, .92, .93, .85, .89 (by subtest); composite, r = .98 (Kuder-Richardson formula 20). Final forms, r = .81, .80, .78, .85, .85 (by subtest); composite, r = .85 (Hoyt's formula).

Correlations: not specified in abstract

Validity: Content from CUPM course guide and appropriate textbooks; terminal behaviors developed using Bloom's Taxonomy, rated by jury of college professors. Final 40 items examined by three "nationally-known authorities in mathematics education".

Reference: Copley, Walter Patrick. The Construction and Validation of an Instrument to Measure the Attainment of Certain Mathematical Concepts Recommended by the Committee on the Undergraduate Program in Mathematics. (Boston University School of Education, 1971.) *Dissertation Abstracts International* 32A: 1954-1955; October 1971. [Order No. 71-26,688]

Title: "*Test on Field Axioms*"

Developed by: D. H. Crawford

Content: measures understanding of the field axioms (properties of the real number system)

Format: 45 quadruple-choice items. Each of 11 field axioms was tested once at each level (33 items) plus four "social" items added at Level I and 8 "ceiling" items after Level III.

Sample: 1000 pupils in grades 4, 6, 8, 9, 10, 12

Reliability: "Analysis of the test, in terms of its reliability, the difficulty of individual items, and the discriminative and distractor properties of the items, seemed to indicate that it was a satisfactory measuring instrument."

Correlations: not specified in abstract

Validity: "The basis of the test was largely empirical. Three levels of difficulty were postulated, corresponding to experiences with different sets of numbers at different grade levels in the 'traditional' curriculum. Bloom's analysis of levels of understanding was also used.

Reference: Crawford, Douglas Houston. An Investigation of Age-Grade Trends in Understanding the Field Axioms. (Syracuse University, 1964.) *Dissertation Abstracts* 25: 5728-5729; April 1965. [Order No. 65-3414]

Title: *Mathematics Opinion Survey*

Developed by: W. B. Crittenden

Content: assesses attitudes of teachers relative to sixteen "deterrents to pupil progress" in mathematics

Format: 50-item and 15-item scales

Sample: 50-item scale administered to 161 elementary and 43 secondary school mathematics teachers in six schools; 15-item scale developed after four iterations of item analysis

Reliability: 50-item scale, not specified in abstract (Kuder-Richardson formula 20); 15-item scale r = .64

Correlations: correlations examined between attitude and teaching level, prior teaching experience, tenure in the district, and mathematics credits

Validity: "Sixteen specific deterrents to pupil progress in mathematics identified by secondary teachers"; instrument capable of measuring attitude of teachers relative to the 16 deterrents.

Reference: Crittenden, William Bryan. A Study of Attitudes of Elementary and Secondary Teachers of Mathematics Toward Selected Deterrents to Pupil Progress. (University of Houston, 1970.) *Dissertation Abstracts International* 32A: 280; July 1971. [Order No. 71-18,460]

Title: "Arithmetic Achievement Test: Supplementary"

Developed by: A. B. Crowder, Jr.

Content: assesses achievement in mathematics, supplementing a standardized achievement test

Format: not specified in abstract

Sample: 425 pupils in grade 1

Reliability: r = .90 (split-halves method); item difficulty and discriminatory power determined

Correlations: not specified in abstract

Validity: "Curricular and statistical validity were established by recognized methods... A validity coefficient of .66 was found between the standardized test and the instrument developed."

Reference: Crowder, Alex Belcher, Jr. A Comparative Study of Two Methods of Teaching Arithmetic in the First Grade. (North Texas State University, 1965.) *Dissertation Abstracts* 26: 3778; January 1966. [Order No. 65-15,112]

Title: Basic Achievement of Common Knowledge and Skills

Developed by: A. S. Deshpande

Content: Common knowledges and skills required for conducting activities in daily living, for use with mentally retarded or educationally backward adolescents and adults in a rehabilitation setting or special education program. Subtests on counting items, basic arithmetic, telling time, making change, line measurement, units of measurement, arithmetic problems, comprehension, common knowledge, traffic, and use of a telephone directory.

Format: short subtests (modal n = 10)

Sample: 106 student-patients (85% had IQ below 95)

Reliability: r = .93 to .99. Item selection on basis of difficulty level (average, .70), high item-test correlations (most .60 to .80), and the factor structure of subtests. Final form, r = .90-plus for ten of 11 subtests. Composite battery, r = .99 (Kuder-Richardson formula 20).

Correlations: Subtests correlated "well" (.53 to .70) with relevant parts of standardized ability and achievement tests.

Validity: Validity coefficients of the subtests and the battery, with relevant parts of psychometric tests such as WAIS, WRAT, or tests such as PPVT or PPBT, range from .53 to .73. Factorial and construct validity "satisfactory". Measures a general factor, two main factors (verbal and numerical), and a third unspecified mechanical, perceptual, or perseverance factor.

Reference: Deshpande, Anant Sakharam. Development of a Battery for the Lower Continuum of Basic Achievement of Common Knowledge and Skills. (University of Georgia, 1968.) *Dissertation Abstracts* 29A: 2999; March 1969. [Order No. 69-3443]

Title: *"Tests on Decimal and Non-Decimal Numeration Systems"*

Developed by: R. C. Diedrich

Content: measures pupil's understanding of the decimal system, processing decimal numerals, and a place-value system in general

Format: 48 multiple-choice items; three subtests of 16 items each; equivalent forms

Sample: 111 pupils in four fourth-grade classes

Reliability: Form 1, r = .65, .76; Form 2, r = .81 (Kuder-Richardson formula 20). Intercorrelations for equivalency and stability were: .36, .32, .34 for part 1: .42, .49, .54 for part 2; .10, .13, .01 for part 3.

Correlations: not specified in article or abstract

Validity: not specified in article or abstract

References: Diedrich, Richard C. and Glennon, Vinent J. The Effects of Studying Decimal and Nondecimal Numeration Systems on Mathematical Understanding, Retention, and Transfer. *Journal for Research in Mathematics Education* 1: 162-172; May 1970.

Diedrich, Richard Charles. The Effects of Studying Decimal and Non-Decimal Numeration Systems on Mathematical Understanding--Retention and Transfer. (Syracuse University, 1969.) *Dissertation Abstracts International* 30A: 3183-3184; February 1970. [Order No. 70-1948]

Title: *Test of Mathematical Understanding, Grade Six*

Developed by: A. N. Dull

Content: measures mathematical understanding at the sixth grade level

Format: 45 multiple-choice items; letters and abstract symbols used in place of numerals in many items; mathematical sentences also used

Sample: Preliminary trial administration and large-scale trial administration of final form. Then administered to 1755 sixth-grade students.

Reliability: r = .76 (Kuder-Richardson formula 20). Mean difficulty of test items, .50; discrimination level over .20 for 35 items.

Correlations: not specified in abstract

Validity: Content determined by analysis of elementary school mathematics textbooks. Concurrent validity coefficient, using student's final grade in sixth-grade mathematics as criterion, .62.

Reference: Dull, Alyn Neil. The Construction and Standardization of a Test of Mathematical Understanding at the Sixth-Grade Level. (University of South Dakota, 1969.) *Dissertation Abstracts International* 30A: 4271; April 1970.

Title: University of California Arithmetic Attitude Scale

Developed by: W. H. Dutton

Content: assesses attitude toward mathematics

Format: 15 items (included in article)

Sample: 160 pre-service elementary education students

Reliability: r = .94

Correlations: not specified in article

Validity: "valid for the measurement of student feeling toward the major aspects of elementary school arithmetic"

Reference: Dutton, Wilbur H. Prospective Elementary School Teachers' Understanding of Arithmetical Concepts. *Journal of Educational Research* 58: 362-365; April 1965.

Title: "*Attitude Toward Arithmetic Scale*"

Developed by: W. H. Dutton

Content: assesses attitude toward mathematics; revision of Dutton's 1956 scale

Format: 10 items on both forms included in article

Sample: 300 junior high school students (1966); 459 students (1956)

Reliability: r = .90 (1956)

Correlations: not specified in article

Validity: see "Content"

Reference: Dutton, Wilbur H. Another Look at Attitudes of Junior High School Pupils Toward Arithmetic. *Elementary School Journal* 68: 265-268; February 1968.

Title: "*Attitude Toward Arithmetic Scale*"

Developed by: W. H. Dutton and M. P. Blum

Content: assesses attitude toward mathematics; contains "strongest" items from Dutton's 1951 scale plus new items

Format: 27 Likert-type items (included in article)

Sample: 346 students in grades 6-8

Reliability: r = .84 (Spearman-Brown test-retest)

Correlations: not specified in article

Validity: see "Content"

Reference: Dutton, Wilbur H. and Blum, Martha Perkins. The Measurement of Attitudes Toward Arithmetic with a Likert-Type Test. *Elementary School Journal* 68: 259-264; February 1968.

Title: *"Transfer Test on Quadratic Inequalities"*

Developed by: P. M. Eastman

Content: quadratic inequalities

Sample: 80 students in grade 10

Reliability: r = .78 (alpha reliability coefficient)

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Eastman, Phillip Murray. The Interaction of Spatial Visualization and General Reasoning Abilities with Instructional Treatment in Quadratic Inequalities: A Follow-Up Study. (The University of Texas at Austin, 1972.) *Dissertation Abstracts International* 33A: 4933; March 1973. [Order No. 73-7544]

Title: "Tests to Measure SMSG Programs"

Developed by: A. S. Edwards

Content: measures "certain of the important objectives" set forth by the School Mathematics Study Group for grades 4-6; appropriate for evaluation of mathematics programs which use SMSG materials

Format: 120 items

Sample: pilot test in grades 4-6; after statistical and content analyses, administered to 657 pupils in grades 4-6 (who had used SMSG materials for a specified time the previous year)

Reliability: r = .90 to .92; factor analyses indicated that each item made a positive contribution to internal consistency

Correlations: not specified in abstract

Validity: see "Content"

Reference: Edwards, Andrew Soule. A Statistical Analysis of the Internal Properties of Three Elementary School Mathematics Tests. (University of Georgia, 1965.) Dissertation Abstracts 26: 6546; May 1966. [Order No. 66-2470]

Title: The Contemporary Mathematical Vocabulary Test

Developed by: C. L. Ehmer

Content: assesses knowledge of (1968) mathematical vocabulary

Format: 100 items

Sample: Reliability established by administration to 600 pupils in grades 4-6. Also administered to 1200 additional pupils in grades 4-6.

Reliability: r = .73 (grade 4), .87 (grade 5), .93 (grade 6)

Correlations: The Arithmetic Vocabulary Test (developed by Buswell and John, 1930), Kuhlmann-Anderson Intelligence Test, and reading and arithmetic subtests from the Stanford Achievement Batteries also administered. "At the fourth grade level, contemporary mathematical vocabulary had a higher correlation, than did any other variable, with the earlier arithmetic vocabulary (.71) and with average arithmetic achievement (.64). At the fifth grade level the highest correlations with contemporary mathematical vocabulary were average reading (.69) and reading comprehension (.67). At the sixth grade the highest correlations with contemporary mathematical vocabulary were average arithmetic (.74) and arithmetic application (.68)."

Validity: constructed on the basis of analysis of 44 arithmetic textbooks and eight related books for teachers and pupils

References: Ehmer, Charles L. The Vocabulary of Contemporary Mathematics. (University of Pittsburgh, 1969.) Dissertation Abstracts International 30B: 5132-5133; May 1970. [Order No. 70-8617]

Olander, Herbert T. and Ehmer, Charles L. What Pupils Know About Vocabulary in Mathematics--1930 and 1968. Elementary School Journal 71: 361-367; April 1971.

Title:	*Eroh Test of Measurement Understandings*
Developed by:	A. R. Eroh
Content:	assesses measurement understanding; Part III designed to measure transfer of learning from familiar to unfamiliar situations
Format:	three parts
Sample:	121 first-grade children from six classes
Reliability:	"Reliability coefficients ranged as high as .87 for Parts I and II combined; and as high as .82 for Part III."
Correlations:	not specified in abstract
Validity:	not specified in abstract
Reference:	Eroh, Agnes Ruth. Development and Evaluation of a Structured Program Compared with an Unstructured Program for Measurement Experiences in Grade I. (Boston University School of Education, 1964.) *Dissertation Abstracts* 28A: 141; July 1967. [Order No. 65-4881]

Title:	"Creative Mathematical Situations Test"
Developed by:	E. W. Evans
Content:	measures ability to respond (in terms of fluency, flexibility, and originality) in creative mathematical situations at the late elementary and early junior high school level
Format:	Presents mathematical situation; student asked to respond in as many different ways as he can. Responses scored with respect to number, number of different kinds, and degree of uncommonness.
Sample:	In two initial stages of testing, 16 of original 27 tests selected and revised. Administered in grades 5 through 8 to students above average in mean intelligence. Ten tests which intercorrelated were then selected.
Reliability:	not specified in abstract
Correlations:	significant positive correlations found between ability to respond on the developed tests and intelligence, arithmetic achievement, grades in mathematics, attitude toward mathematics, and general creativity
Validity:	not specified in abstract
Reference:	Evans, Edward William. Measuring the Ability of Students to Respond in Creative Mathematical Situations at the Late Elementary and Early Junior High school Level. (The University of Michigan, 1964.) Dissertation Abstracts 25: 7108-7109; June 1965. [Order No. 65-5302]

Title: Recall Test; Symbolic Transfer Tests I and II; Concrete Transfer Test

Developed by: E. H. Fennema

Content: assesses instances of taught principles for multiplication defined as the union of equivalent disjoint sets

Format: Recall Test, problems to be solved were all instances of the principles taught. Symbolic Transfer Tests identical in format; Test I, children used materials as aids; Test II, children used counters as aids.

Sample: 95 pupils aged 7-8 (grade 2)

Reliability: Recall Test, r = .91; Symbolic Transfer Test I, r = .92; Symbolic Transfer Test II, r = .93 (Hoyt reliability formula). (Concrete Transfer Test noted in dissertation but not article.)

Correlations: not specified in article or abstract

Validity: "tests had high content validity" -- total domain of content was included and was arranged in test randomly, thus meeting Nunnally's criteria for content validity

References: Fennema, Elizabeth Hammer. A Study of the Relative Effectiveness of a Meaningful Concrete and a Meaningful Symbolic Model in Learning a Selected Mathematical Principle. (University of Wisconsin, 1969.) Dissertation Abstracts International 30A: 5338-5339; June 1970. [Order No. 69-22,380]

Fennema, Elizabeth H. The Relative Effectiveness of a Symbolic and a Concrete Model in Learning a Selected Mathematical Principle. Journal for Research in Mathematics Education 3: 233-238; November 1972.

Fennema, Elizabeth Hammer. A Study of the Relative Effectiveness of a Meaningful Concrete and a Meaningful Symbolic Model in Learning a Selected Mathematical Principle. Technical Report No. 101. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1969. ED 036 444. 205 pages.

Title: "*Instrument to Measure Mathelation*"

Developed by: N. C. Fisher

Content: assesses "mathelation", a bidirectional component of the mathematical problem-solving process involving ability to translate and fit an idealized real-world problem situation into appropriate mathematical expressions or models

Format: two parts, 100 items

Sample: 64 pre-service elementary teachers in validation sample, 103 pre-service elementary teachers in study

Reliability: r = .83, .83. Correlation of Parts I and II, .61.

Correlations: correlation of mathelation score with critical thinking ability (WGCTA), .50; mathematics achievement (STEP Series II), .68; mathematics attitude (Dutton scale), .31; high school mathematics background (grades and years), .39; college mathematics background (grades and hours), .33

Validity: content validity determined by a panel of mathematics educators and mathematicians

Reference: Fisher, Nancy Capozzolo. Mathematical problem-Solving's Mathelation Component Related to Achievement, Attitude, Critical Thinking in Prospective Elementary Teachers. (Indiana University, 1972.) *Dissertation Abstracts International* 33A: 5965-5966; May 1973. [Order No. 73-10,814]

Title: *Teaching Situation Reaction Test for Teachers of Secondary School Mathematics*

Developed by: B. V. Flora, Jr.

Content: Measures selected characteristics which are assumed to help determine the teaching behavior of teachers of secondary school mathematics. Developed for diagnostic use in methods courses for prospective teachers of secondary school mathematics.

Format: 50-item pencil-and-paper test, in which teachers indicate ordering of four choices offered with each statement or question following brief descriptions of teaching situations on 10 teacher-behavior-characteristic dimensions (two sample items included in article)

Sample: 34 pre-service and 48 in-service secondary mathematics teachers

Reliability: r = .85, .90 (test-retest, product-moment correlations, n = 27 and 20); interitem and dimension correlations determined

Correlations: not specified in abstract or article

Validity: Predictive validity determined; the instrument discriminates between highly effective and minimally effective teachers. Based on Teaching Situation Reaction Test developed by Duncan.

References: Flora, Ben Vivian, Jr. Development of an Instrument for Assessing Teacher Behavior Characteristics of Teachers of Secondary School Mathematics. (The Ohio State University, 1969.) *Dissertation Abstracts International* 31A: 662-663; August 1970.

Flora, Ben V., Jr. Diagnosing Selected Behavior Characteristics of Teachers of Secondary School Mathematics. *Journal for Research in Mathematics Education* 3: 7-20; January 1972.

Title:	"Test of Conceptual Development"
Developed by:	P. S. Freyberg
Content:	measures conservation attainment--conservation of quantity and weight, of numerical correspondence, of additive composition of numbers and classes, and of concepts of position in space, speed, age, kinship, and causal relationships
Format:	72 objective items, group-administered (18 four-item concepts that were similar to tasks Piaget presented). All but five items multiple-choice, illustrated by simple diagrams.
Sample:	(1) 151 pupils aged 5-9 to 7-10 in four schools (2) 180 pupils in four second-grade and four third-grade classes in four schools
Reliability:	(1) r = .91 (test-retest, n = 99); r = .87 (split-half corrected)
Correlations:	(1) Correlations with attainment variables (attainment tests consisted of a speeded computation test of 120 items involving addition, subtraction, multiplication and division (r = .93, retest, n = 70); a 25-item test of arithmetic problem solving (r = .89, n = 68), .52 to .57. Correlation with MA, .52; with CA, .17. (2) Correlated with Lorge Thorndike Intelligence Test, .23; and with Stanford Achievement Test, Arithmetic concepts, .81 (significant beyond .01 level).
Validity:	(1) validity of the objective test as a group instrument assessed by comparing the results from 17 items with scores on corresponding Piagetian tests in a clinical situation, r = .72 (n = 101)
References:	(1) Freyberg, P. S. Concept Development in Piagetian Terms in Relation to School Attainment. Journal of Educational Psychology 57: 164-168; 1966. (2) Freyberg, P.S. Some Aspects of Intellectual Development in Children Aged Six to Nine Years: A Longitudinal Study. Unpublished doctoral dissertation, Victoria University, 1964. (2) Kaminsky, Mildred. A Study of the Status of Conservation Ability in Relationship to Arithmetic Achievement. (Wayne State University, 1970.) Dissertation Abstracts International 31A: 3341; January 1971. [Order No. 71-425]

Title: *Primary Test and Intermediate Test to Assess Basic Arithmetical Understandings*

Developed by: J. L. Garner and F. Flournoy

Content: measures understanding of basic concepts and principles in elementary arithmetic "in harmony with the objectives of new curricula". Includes numeration system and processes with whole and fractional numbers, plus decimals for grades 5 and 6.

Format: Primary Test, 114 items; Intermediate Test, 132 items. Multiple-choice items to be read aloud by teacher, with alternative responses read silently. Application of principles rather than computational.

Sample: 574 items tried out, each by approximately 65 pupils in two schools; items selected on basis of difficulty and discrimination indices. Primary Test administered to 230 pupils in grades 3-6, Intermediate Test administered to 240 pupils in grades 4-6, in three schools.

Reliability: Grade 1, r = .82; grade 2, .88; grade 3, .91; grade 4, .96; grade 5, .92; grade 6, .95 (Kuder-Richardson formula 20)

Correlations: see "Validity"

Validity: Basic concepts identified from literature and 91 understandings selected for testing; content validity "obtained by designing test items which were identified with understandings to be tested". Validity coefficients based on comparison with Metropolitan Achievement Test in Arithmetic; grade 1, .51; grade 2, .23; grade 3, .36; grade 4, .56; grade 5, .54; grade 6, .34 ("correlations were low, which indicates that the two tests measure different knowledges in arithmetic which are not highly comparable").

References: Garner, Jewell Lorain. The Construction and Administration of Two Objective Tests Designed to Assess Basic Arithmetical Understandings of Elementary School Pupils. (The University of Texas, 1964.) *Dissertation Abstracts* 26: 1992-1993; October 1965. [Order No. 65-4312]

Flournoy, Frances. A Study of Pupils' Understanding of Arithmetic in the Primary Grades. *Arithmetic Teacher* 14: 481-485; October 1967. [includes some items]

[Garner: continued]

Flournoy, Frances. A Study of Pupils' Understanding of Arithmetic in the Intermediate Grades. School Science and Mathematics 47: 325-333; April 1967. [includes some items]

Flournoy, Frances. The Development of Arithmetic Understanding Tests for Primary and Intermediate Levels. Journal of Educational Research 62: 73-76; October 1968. [norms established and reported]

Title: Test for Elementary Education Majors

Developed by: E. W. Garnett

Content: measures knowledge of mathematical concepts

Format: not specified in abstract

Sample: 4467 students in 84 colleges having elementary education programs in 37 states

Reliability: "establishing test reliability and content validity were major parts of the study"

Correlations: not specified in abstract

Validity: based on CUPM recommendations

Reference: Garnett, Emma Whitlock. A Study of the Relationship Between the Mathematics Knowledge and the Mathematics Preparation of Undergraduate Elementary Education Majors. (George Peabody College for Teachers, 1968.) Dissertation Abstracts International 30A: 1448; October 1969. [Order No. 69-13,822]

Title: "Test on Mathematical Rules"

Developed by: L. R. Gay

Content: assesses attainment related to four principles from algebra and geometry

Format: 8 problems on four rules

Sample: 120 students in grades 7 and 8

Reliability: r = .58, .62, .81, .57, .67, .83 (Kuder-Richardson formula 20)

Correlations: not specified in article

Validity: not specified in article

Reference Gay, Lorraine R. Temporal Position of Reviews and Its Effect on the Retention of Mathematical Rules. Journal of Educational Psychology 64: 171-182; April 1973.

Gay, Lorraine Rumbel. Temporal Position of Reviews and Its Effect on the Retention of Mathematical Rules. (The Florida State University, 1970.) Dissertation Abstracts International 32A: 237; July 1971. [Order No. 71-18,361]

Title: "*Test of Basic Mathematical Understandings*"

Developed by: T. C. Gibney, J. L. Ginther, and F. L. Pigge

Content: measures selected basic mathematical understandings of seven areas: geometry, number theory, numeration systems, fractional numbers, structural properties for the set of whole numbers, sets, and the four basic operations on the set of whole numbers

Format: 65 items (seven sample items in February 1970 article)

Sample: 1077 pre- and in-service elementary school teachers

Reliability: r = .80 (Kuder-Richardson formula 21). Item discriminiation analysis indicated that 23 items had an index between .40 and 1.00, 27 items between .20 and .39, 13 items between .01 and .19, and two items between -1.00 and .00. Median difficulty was .52.

Correlations: not specified in article

Validity: not specified in article

References: Gibney, Thomas C.; Ginther, John L.; and Pigge, Fred. The Mathematical Understandings of Preservice and In-Service Teachers. *Arithmetic Teacher* 17: 155-162; February 1970.

Gibney, Thomas C.; Ginther, John L.; and Pigge, Fred L. What Influences the Mathematical Understanding of Elementary-School Teachers? *Elementary School Journal* 70: 367-372; April 1970.

Title: "*Tests on Length*"

Developed by: L. E. Gilbert

Content: assesses effect of training on length

Format: 12 questions, individual interview; problems to be solved using given training on length. (Items described in article.)

Sample: 71 kindergarten children

Reliability: r = .19 (pretest), .72 (posttest). Item difficulties ranged from .00 to .79 (pretest), .00 to .96 (posttest).

Correlations: not specified in article

Validity: not specified in article

References: Gilbert, Lynn E. An Introduction of Length Concepts to Kindergarten Children. Technical Report No. 102. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1969. ED 036 335. 100 pages.

Romberg, Thomas A. and Gilbert, Lynn E. The Effect of Training on Length on the Performance of Kindergarten Children on Nonstandard But Related Tasks. *Journal for Research in Mathematics Education* 3: 69-75; March 1972.

Title: "*Tests of Multiplication Achievement, Retention, and Transfer*"

Developed by: R. F. Gray

Content: measures achievement, retention and transfer in introductory multiplication

Format: pretest, 40 items, paper-and-pencil; four other tests

Sample: 22 third-grade classes (480 pupils)

Reliability: pretest, r = .94; posttest, r = .93; retention test, r = .88; posttest of transfer, r = .82; retention test of transfer, r = .87

Correlations: not specified in article or abstract

Validity: not specified in article or abstract

References: Gray, Roland F. An Experiment in the Teaching of Introductory Multiplication. *Arithmetic Teacher* 12: 199-203; March 1965.

Gray, Roland F. An Experimental Study of Introductory Multiplication. (University of California, Berkeley, 1964.) *Dissertation Abstracts* 25: 6432; May 1965.

Title: "Test of Understanding of Contemporary Arithmetic"

Developed by: J. D. Griffin

Content: measures elementary school teachers' understanding of and ability in contemporary arithmetic

Format: 60 items, 27 classified as "modern mathematics"

Sample: 1107 elementary school teachers

Reliability: r = .88 (test-retest)

Correlations: correlated with such factors as years of teaching, amount of inservice, preparatory background, etc.

Validity: "content validity relative to the aspects of arithmetic this study was seeking to measure"

Reference: Griffin, John Duncan. North Carolina Elementary School Teachers' Understanding of Contemporary Arithmetic. (Duke University, 1966.) Dissertation Abstracts 27A: 3616; May 1967. [Order No. 67-6285]

Title:	*"Achievement Test -- Mathematics Course"*
Developed by:	G. B. Grunwald
Content:	measures mathematics achievement
Format:	not specified in abstract
Sample:	247 pre-service teachers in a content mathematics course
Reliability:	r = .87 (Kuder-Richardson formula 20)
Correlations:	correlated with SAT verbal and SAT mathematics scores, cumulative grade point ratios -- .76
Validity:	not specified in abstract
Reference:	Grunwald, George B. The Relative Effectiveness of Different Types of Help-Sessions When Teaching Mathematics to a Large Section of Prospective Elementary Teachers. (George Peabody College for Teachers, 1969.) *Dissertation Abstracts International* 30A: 4874; May 1970. [Order No. 70-7631]

Title:	"*Understanding of Place Value and Principles of Arithmetic*"
Developed by:	C. H. Haggard
Content:	measures understanding of place value and principles of arithmetic
Format:	14 items
Sample:	616 pre-service elementary school teachers
Reliability:	not specified in abstract (Kuder-Richardson formula 20, internal consistency)
Correlations:	not specified in abstract
Validity:	for validity, correlated with scores on Stanford Achievement Test
Reference:	Haggard, Charles Harmon. A Study of the Mathematical Understanding of Pre-Service Elementary School Teachers in Selected Kentucky Teacher Education Institutions. (University of Kentucky, 1971.) *Dissertation Abstracts International* 32A: 1957-1958; October 1971. [Order No. 71-25,895]

Title: *Test of Quantitative Judgment (Form T)*

Developed by: C. T. Hall

Content: measures ability on aspects of quantitative judgment

Format: 60 multiple-choice items

Sample: 60 new items similar to those in the original Test of Quantitative Judgment (Form H) were administered to 151 pupils in grades 4-6. 30 items selected using item analysis from pilot test and 30 items from Form H. New test (Form T) administered to 637 pupils in grades 4-6.

Reliability: r = .78 (Kuder-Richardson formula 20)

Correlations: not specified in abstract

Validity: Congruent validity indicated that Form H was measuring something other than general intelligence or arithmetic understanding; "since the items are consistent in both forms, the same is implied for Form T." Reliability improved from Form H to Form T, thus "self-defining validity improves in the sense that pupils are actually demonstrating the criterion when taking the test". "From the point of view of judgmental validities--constructor, user, and face--the test appears to be measuring consistently with the objectives of the test writers."

Reference: Hall, Cynthia Tuttle. Determining Some Validities of the Test of Quantitative Judgment (Form T). (University of Massachusetts, 1970.) *Dissertation Abstracts International* 31A: 4382; March 1971. [Order No. 71-5961]

Title: *Test of Quantitative Judgment*

Developed by: D. E. Hall

Content: assesses aspects of quantitative judgment

Format: not specified in abstract

Sample: preliminary study, then administered to 704 pupils in grades 4-6

Reliability: r = .77 (grade 4), .67 (grade 5), .72 (grade 6) (Kuder-Richardson formula 20); also test-retest reliability for a representative sample

Correlations: Intercorrelations were determined among measures for IQ (Kuhlmann-Anderson Intelligence Tests), arithmetic understanding (Functional Evaluation in Mathematics, Test I), chronological age, mental age, and Quantitative Judgment Test scores. Quantitative judgment was found to be something other than intelligence or arithmetic ability.

Validity: statistical validity determined

Reference: Hall, Donald Eugene. The Ability of Intermediate Grade Children to Deal with Aspects of Quantitative Judgment. (Boston University School of Education, 1966.) *Dissertation Abstracts* 27A: 2730; March 1967. [Order No. 66-14,778]

Title: "*Criterion Test: Addition of Fractions*"

Developed by: W. H. Hall

Content: addition of fractions

Format: 41 items

Sample: pupils in grade 6

Reliability: $r > .90$ (alpha)

Correlations: not specified in abstract

Validity: "The way in which the instrument was constructed ensured its content validity."

Reference: Hall, Wayne Hawkins. The Effect on Performance of Number of Exercises, Feedback, and Amount of Detail. (George Peabody College for Teachers, 1970.) *Dissertation Abstracts International* 31B: 4839-4840; February 1971. [Order No. 71-4261]

Title: *Test of Elementary Mathematical Understandings*

Developed by: M. L. Hartlein

Content: measures elementary understandings of pupils in grades 5 and 6

Format: 45 multiple-choice items

Sample: Preliminary items tried in oral and written form in grades 4-8; evaluated; additional items written. Pairs of items set up to measure effects of number words and coding on test question. Two preliminary tests of 40 items each constructed, administered to 207 pupils and 170 pupils in grades 5 and 6; items evaluated for difficulty and discriminatory power. Final form administered to 413 pupils in grades 5 and 6.

Reliability: r = .83 (Pearson's Product Moment correlation); discrimination indexes, .40 or above for 33 of 45 items

Correlations: Comparison with scores on achievement and IQ tests: arithmetic computation, .57 (grade 5) and .72 (grade 6); problem solving, .53, .60; arithmetic concepts, .65, .77; verbal IQ, .59, .67; nonverbal IQ, .58, .64; reading comprehension, .56, .60; reading vocabulary, .50, .60 (significant at .01 level). Partial correlation coefficients also given in abstract.

Validity: List of concepts to be measured was compiled and checked against several sources. Concepts and items evaluated by five jurors for importance of concepts and validity of items.

Reference: Hartlein, Marion Louise. Construction and Evaluation of a Test to Measure Elementary Mathematical Understandings. (University of Maryland, 1965.) *Dissertation Abstracts* 26: 5915-5916; April 1966. [Order No. 65-4450]

Title: *"Cloze Tests of Reading Comprehensibility of Mathematical Passages"*

Developed by: M. A. Hater

Content: assesses comprehension and difficulty of mathematical English passages

Format: five mathematical English passages, five comprehension tests, and 25 cloze tests (five for each passage), constructed by deleting words or symbols from passages and replacing them with blanks; student attempts to complete the passage

Sample: 1717 students in grades 7-10

Reliability: "highly reliable" (Kuder-Richardson formula 20 and ranking of means)

Correlations: see "Validity"

Validity: Assessed for reading comprehensibility of mathematical English by correlating scores on cloze tests with scores on comprehension tests written over the same passages (correlation, .69); validity as a measure of reading difficulty assessed by correlating means on cloze tests with means on comprehension tests written over the same passages. "There is enough evidence to suggest that cloze tests are valid predictors of reading difficulty for mathematical English passages."

Reference: Hater, Sister Mary Ann. The Cloze Procedure as a Measure of the Reading Comprehensibility and Difficulty of Mathematical English. (Purdue University, 1969.) *Dissertation Abstracts International* 30A: 4829; May 1970. [Order No. 70-8900]

Hater, Mary A. and Others. The Cloze Procedure as a Measure of the Reading Difficulty of Mathematical English Passages. 1972. ERIC: ED 071 056. 66 pages.

Title: *"Unit Tests on Numeration Systems, Properties of Whole Numbers, Elementary Number Theory, and Finite Mathematical Systems"*; *"Comprehensive Final Test"*

Developed by: L. L. Hatfield

Content: assesses achievement on units on numeration systems, properties of whole numbers, elementary number theory, and finite mathematical systems

Format: not specified in article or abstract

Sample: 103 students in four grade 7 mathematics classes

Reliability: reliabilities for all tests used in study ranged from .69 to .90 (Kuder-Richardson formula 21)

Correlations: not specified in article or abstract

Validity: tests involved "a sample of the concepts, principles, and processes from the unit"

References: Hatfield, Larry Lee. Computer-Assisted Mathematics: An Investigation of the Effectiveness of the Computer Used as a Tool to Learn Mathematics. (University of Minnesota, 1969.) *Dissertation Abstracts International* 30A: 4329-4330; April 1970. [Order No. 70-5569]

Hatfield, Larry L. and Kieren, Thomas E. Computer-Assisted Problem Solving in School Mathematics. *Journal for Research in Mathematics Education* 3: 99-112; March 1972.

Title: "Test of Selected Mathematical Abilities of Kindergarten Children"

Developed by: N. L. Heimgartner

Content: assesses selected mathematical abilities, including recognition of numerals 1-10, ordinal numbers, knowledge of 'before' and 'after', rational number concepts, addition and subtraction symbols, counting, measurement with time and money

Format: not specified in abstract

Sample: 224 pupils in kindergarten

Reliability: $r = .94$

Correlations: not specified in abstract

Validity: based on textbooks used in first grades

Reference: Heimgartner, Norman Louis. Selected Mathematical Abilities of Beginning Kindergarten Children. (Colorado State College, 1968.) Dissertation Abstracts 29: 406-407; August 1968. [Order No. 68-11,891]

Title:	*Profundity Test* and *Conditional Reasoning Test*
Developed by:	D. J. Heisey
Content:	PT assesses skill at making and verbalizing various interpretations of verbal statements; CRT measures mastery of some simple principles of logic
Format:	PT, constructed response; CRT, not specified in abstract
Sample:	40 undergraduate elementary education students in axiomatic geometry course
Reliability:	PT, r = .85; CRT, r = .86 (test-retest)
Correlations:	PT scores correlated highest with the prover-nonprover dichotomy
Validity:	"validity of both tests was discussed at length" [in the dissertation]
Reference:	Heisey, Daniel Joseph. A Characterization of Provers and Nonprovers in an Axiomatic Geometry Course for Elementary Education Majors: A Discriminant Analysis. (Purdue University, 1966.) *Dissertation Abstracts* 27A: 413-414; August 1966. [Order No. 66-7434]

Title: *"Instrument for Assessing Mathematics Classroom Discourse"*

Developed by: N. G. Hernandez

Content: analysis of teacher discourse in the mathematics classroom: three dimensions (Styles of Presentation, Inferred Cognitive Processes, and Modes of Discourse) with ten categories: Semantic-Figural, Memory, Convergent, Questions, Classification, Narration (events), Narration (directions), Evaluation (+), Evaluation (-), and Nonmanagerial

Format: coding system

Sample: four eighth-grade teachers

Reliability: $r > .70$ (intraclass correlation coefficient): by category, $r = .79, .94, .87, .97, .92, .91, .89, .95, .78, .85$

Correlations: not specified in abstract or article

Validity: correspondence of model with Guilford and Kinneavy structures noted

References: Hernandez, Norma Eugenia Gonsalez. An Observation System to Analyze Cognitive Content of Teacher Discourse in a Mathematics Lesson. (The University of Texas at Austin, 1970.) *Dissertation Abstracts International* 31A: 1664; October 1970. [Order No. 70-18,252]

Hernandez, Norma G. A Model of Classroom Discourse for Use in Conducting Aptitude-Treatment Interaction Studies. *Journal for Research in Mathematics Education* 4: 161-169; May 1973.

Title: *Creative Problem Solving Test*

Developed by: A. A. Hiatt

Content: assesses mathematical thinking at intermediate and high school levels

Format: two parts--convergent thinking and divergent thinking; first, non-routine problems similar to word problems; second, mathematical problems, with total score determined by summing fluency, flexibility, and originality scores

Sample: 60 students each in grades 6, 9, 12

Reliability: not specified in abstract

Correlations: Correlation matrixes calculated with Lorge-Thorndike Intelligence Test, Comprehensive Test of Basic Skills, Iowa Tests of Educational Development, and Differential Aptitude Tests; also correlated with two tests from Guilford's structure-of-intellect model. Only two of 40 correlation coefficients not significant; highest correlation was .63. "These low correlation coefficients provided confidence that the instrument did indeed measure certain abilities not measured by standardized measures."

Validity: Commentaries on mathematical thinking synthesized; "expert counsel" of eight mathematicians and mathematics educators. Model formulated with 17 components, then instrument constructed. Experts agreed that the instrument measured 14 of the 17 components. "Other validation procedures were conducted."

Reference: Hiatt, Arthur Allen. Assessing Mathematical Thinking Abilities of Sixth, Ninth, and Twelfth Grade Students. (University of California, Berkeley, 1970.) *Dissertation Abstracts International* 31B: 7427-7428; June 1971. [Order No. 71-15,785]

Title: "Tests on Complex Numbers"

Developed by: C. R. Hirsch, Jr.

Content: tests measure initial learning, vertical and lateral transfer, and retention for an extended unit on complex numbers

Format: initial learning and retention tests, 25 multiple-choice items on each; vertical transfer test, 11 problems; lateral transfer test, 7 items

Sample: 213 second-year algebra students in 6 schools

Reliability: not specified in abstract

Correlations: not specified in abstract

Validity: Content validity of each of the four tests and the construct validity of the two transfer tests were judged by a committee of three members of the mathematics education faculty.

Reference: Hirsch, Christian Richard, Jr. An Experimental Study Comparing the Effects of Guided Discovery an Individualized Instruction on Initial Learning, Transfer, and Retention of Mathematical Concepts and Generalizations. (The University of Iowa, 1972.) Dissertation Abstracts International 33B: 3194-3195; January 1973. [Order No. 73-640]

Title: "Parallel Tests of Mathematical Concepts; Test of Directed Numbers"

Developed by: J. R. Hodges

Content: includes sets, partitions, variables, subscripts, definitions, postulates, identity and inverse elements, operations, relations, isomorphisms; directed numbers

Format: not specified in abstract

Sample: 63 students in grade 8

Reliability: Test of Directed Numbers, r = .80 (Kuder-Richardson coefficient)

Correlations: correlation of Parallel Tests, .70

Validity: criterion measures

Reference: Hodges, John Raymond. A Study of the Ability of a Group of Eighth Grade Students to Learn and Use Certain Mathematical Concepts. (George Peabody College for Teachers, 1963.) *Dissertation Abstracts* 24: 5430; June 1964. [Order No. 64-5084]

Title: Mathematics Self-Concept Scale

Developed by: K. A. Holly

Content: assesses mathematics self-concept

Format: 10 items (included in article)

Sample: Preliminary 20-item form administered twice to 34 ninth-grade students; separate item analyses carried out; nine best-descriminating items retained and one additional item added. Final form administered to 183 seventh-grade students in one school.

Reliability: r = .81 (nine-item scale, test-retest reliability)

Correlations: Correlation of nine-item scale with teacher's rankings of achievement in algebra (r = .31, n = 30), final grades in eighth-grade course in basic mathematics (r = .10, n = 25), Iowa Algebra Aptitude Test (r = .25, n = 28), and California Test of Mental Maturity (r = .61, n = 24). Correlation of ten-item scale with 18 other measures; significant correlations were found with: number of hours of study at home each week (.24), number of times school was discussed each week with parents (.27), socioeconomic status (.17), Lorge-Thorndike Intelligence Test Verbal IQ (.32) and Nonverbal IQ (.34), Comprehensive Test of Basic Skills pretest (.47) and posttest (.46), Prescriptive Mathematics Inventory (.48), Intellectual Achievement Responsibility Questionnaire Positive Events Score (.23), and School Sentiment Index (.48).

Validity: not specified in article

Reference: Holly, Keith A.; Purl, Mabel C.; Dawson, Judith A.; and Michael, William B. The Relationship of an Experimental Form of the Mathematics Self-Concept Scale to Cognitive and Noncognitive Variables for a Sample of Seventh-Grade Pupils in a Middle-Class Southern California Community. Educational and Psychological Measurement 33: 505-508; Summer 1973.

Title: "*Two Tests for UCISM High School Mathematics Course 1*"

Developed by: H. Ikeda

Content: measures achievement on first five chapters of UICSM mathematics

Format: 54 items; most items consist of four sub-items

Sample: 154 ninth-grade students

Reliability: not specified in abstract

Correlations: Intercorrelations among items computed; each matrix factor-analyzed, described in abstract.

Validity: see "Correlations"

Reference: Ikeda, Hiroshi. A Factorial Study of the Relationships Between Teacher-Held Objectives and Student Performance in UICSM High School Mathematics. (University of Illinois, 1965.) *Dissertation Abstracts* 26: 2588; November 1965. [Order No. 65-11,800]

Title: Jansson Assessment of Critical Thinking Ability in Mathematics

Developed by: L. C. Jansson

Content: measures six components of critical thinking--ambiguity, assumption, deduction, definition, conjecture, model selection

Format: 50 items

Sample: Two preliminary forms administered to two groups of 69 prospective elementary and secondary teachers; items selected according to specified criteria. Revised 50-item test administered to 258 prospective secondary and elementary teachers, non-mathematics-major college freshmen, and able senior high school students.

Reliability: "quite satisfactory" for the test as a whole; categories not sufficiently reliable to be used for diagnostic purposes

Correlations: see "Validity"

Validity: Six components of critical thinking were identified; these categories served as a basis for writing items. All items submitted to panel of experts for content validity judgment; only items approved by more than three-fourths of the panel were retained. Scores on Cornell Critical Thinking Test, Level Z, and Scholastic Aptitude Test Scores in Mathematics correlated positively and significantly with this test. The six categories intercorrelated significantly, but not highly. "These results suggest that (the test) is valid from this construct validity point of view."

Reference: Jansson, Lars Crispin. The Development of an Instrument to Assess Critical Thinking Ability in Mathematics. (Temple University, 1970.) Dissertation Abstracts International 32A: 1383; September 1971. [Order No. 71-10,816]

Title: *Test on GENMA-Form II* [General Mathematics]

Developed by: L. C. Jansson

Content: assesses achievement in ninth-grade general mathematics

Format: 32 multiple-choice items; paper-and-pencil

Sample: 367 students in grade 9 general mathematics classes

Reliability: r = .59 to .75 (pretest), .76 to .84 (posttest)

Correlations: significant correlation with previous achievement found for two of four groups

Validity: developed to assess objectives of a year-long CAI course (GENMA) as well as the non-CAI version

Reference: Mitzel, Harold E.; Hall, Keith A.; Suydam, Marilyn N.; Jansson, Lars C.; and Igo, Robert V. *A Commonwealth Consortium to Develop, Implement and Evaluate a Pilot Program of Computer-Assisted Instruction for Urban High Schools*, Final Report. University Park, Pennsylvania: The Pennsylvania State University, 1971. ED 059 604. 232 pages.

Title: "*Understandings of the Real Number System*"

Developed by: O. W. Jensen

Content: measures understandings of the real number system and its sub-systems necessary to prospective elementary school teachers

Format: 50 multiple-choice items; norm tables for groups with selected mathematical backgrounds; subscores for "sets", "operations", "factors and primes", "number systems"

Sample: administered to 1043 students at 11 teacher-preparation institutions

Reliability: r = .85

Correlations: not specified in abstract

Validity: 46 understandings identified after search of source materials in elementary school mathematics; rated by panel of "authorities" as essential and/or desirable. "Validity was further established by a relatively high correlation between the instrument and another test that covered the same material."

Reference: Jensen, Ove William. The Development and Standardization of a Test of Understandings of the Real Number System. (University of Miami, 1967.) *Dissertation Abstracts* 28A: 988; September 1967. [Order No. 67-9238]

Title:	Julian Elementary Test of Geometry Achievements, Form A and Form B
Developed by:	A. F. Q. Julian
Content:	assesses certain goals of the cognitive domain attained by students in an elementary school geometry program
Format:	multiple-choice items
Sample:	1176 students (Form A, n = 664; Form B, n = 698; 186 students involved in analysis of stability) in grades 3 through 8
Reliability:	r = .96 for each form (Kuder-Richardson formula 20); tended to increase directly with grade-level increase. Mean item difficulty index for Form A, .36 (range, .16 to .54); for form B, .35 (range, .14 to .51). Median biserial correlation, Form A, .83; Form B, .83; Form A, 28 items with at least .80 (range, .45 to .99; Form B, 35 items with at least .80 (range, .27 to 1.00). Equivalence determined by reversing oder of test administration: A then B, .83; B then A, .80; indices increased directly with grade level increase. Coefficients of stability, Form A, .88; Form B, .82. Additional information on indices of difficulty included in abstract.
Correlations:	Scores compared with scores on standardized tests of mental abilities, reading level, arithmetic computation ability, and arithmetic reasoning ability; significant correlations (Pearson r) noted in abstract.
Validity:	not specified in abstract
Reference:	Julian, Arthur Francis Quarry. A Comparative Study of Scores Measuring Achievement of Goals of the Cognitive Domain Between a Newly Devised Elementary Geometry Test and Some Commonly Administered Standardized Tests of the Elementary School. (The Pennsylvania State University, 1971.) Dissertation Abstracts International 32A: 4838-4839; March 1972. [Order No. 72-9483]

Title: "Tests Built from Piaget's Tasks"

Developed by: A. S. Kaufman

Content: assesses attainment on Piagetian tasks of length, conservation of number, ordination and cardination, lines, and logical classification

Format: 13 tasks; 20-25 minutes individual administration. Five subtests; tasks requiring performance rather than verbalization chosen whenever possible. (Tasks specified in article (1).)

Sample: 103 kindergarten children in study in article (1); 80 first-grade pupils in study in article (2)

Reliability: r = .80 (coefficient alpha, n = 103)

Correlations: Correlated highly (.55) with Lorge-Thorndike IQ and with Lorge-Thorndike MA (.62) at kindergarten level. Correlated at first-grade level with Gesell School Readiness Tests, .60; with Lorge-Thorndike MA, .57; with Stanford Achievement Test, Arithmetic, .60. Multiple-predictor correlations also given.

Validity: derived from Piagetian tasks; see "Correlations"

References: (1) Kaufman, Alan S. and Kaufman, Nadeen L. Tests Built from Piaget's and Gesell's Tasks as Predictors of First-Grade Achievement. Child Development 43: 521-535; June 1972.

(2) Kaufman, Alan S. Piaget and Gesell: A Psychometric Analysis of Tests Built from Their Tasks. Child Development 42: 1341-1360; 1971.

(3) Kaufman, Alan S. Comparison of Tests Built from Piaget's and Gesell's Tasks: An Analysis of Their Psychometric Properties and Psychological Meaning. (Columbia University, 1970.)

Title: "Geometry Test"

Developed by: V. I. Keith

Content: general geometric concepts the teacher should know as recommended by CUPM, SMSG, and CEEB, and concepts and skills the students are expected to learn from the textbook

Format: teacher- and student-level questions

Sample: 199 in-service elementary school teachers

Reliability: not specified in abstract

Correlations: not specified in abstract

Validity: "validated"

Reference: Keith, Virgie Irene. Elementary Teachers' Knowledge of the Geometry Appearing in Elementary School Mathematics Textbooks. (University of Virginia, 1970.) Dissertation Abstracts International 31A: 5037; April 1971. [Order No. 71-6688]

Title: "Test of Skill in Solving Mathematics Teaching Problems"

Developed by: J. W. Kennedy

Content: measures teaching skill in solving certain problems occurring in teacher-pupil discussions

Format: Simplified teaching situations derived from tape recordings of ninth-grade algebra classes. Each of 17 problems consists of a 10-70 second recording, the textbook example, student board work where appropriate, and one to three questions about the discussion.

Sample: given 311 times to undergraduate elementary education majors, teachers with experience in fields other than mathematics, pre-service mathematics teachers at various levels, and experienced mathematics teachers

Reliability: r = .77, .68, .54 (estimated from split-half correlation coefficients) for non-mathematically-prepared individuals, preparatory mathematics teachers, and experienced mathematics teachers. For experienced mathematics teachers in an NSF institute, r = .41. "Found not reliable for any single group, but an estimate of reliability of .90 was determined for the total group."

Correlations: not specified in abstract

Validity: "Exhibits formal validity as viewed by experts in mathematics education and by experienced mathematics teachers...appears to be realistic and typical of certain problems which teachers must solve in the classroom." "Possesses experimental validity as shown by its ability to differentiate groups of persons variously related to mathematics teaching."

Reference: Kennedy, Joseph Wilson. The Development of a Test of Skill in Solving Mathematics Teaching Problems. (Indiana University, 1963.) Dissertation Abstracts 24: 3202-3203; February 1964. [Order No. 64-1681]

Title: Test to Elicit Mathematical Statements

Developed by: P. R. Kessinger

Content: assesses student's predisposition to offer mathematical descriptions to problem situations ("thought relevant to the determination of mathematical talent prior to its exhibition in achievement")

Format: freely generated (student-composed) responses, computer-controlled analyses

Sample: Presented in two equivalent forms to students in grades 4-9; all available students tested on both forms with a three-month interval between tests. 50 students selected randomly from each grade (n = 300).

Reliability: not specified in abstract

Correlations: Significant correlations found within grades between scores on the test and previous mathematics achievement, and between scores on the test and scores on the Stanford Achievement Test, Form Y.

Validity: not specified in abstract

Reference: Kessinger, Peter Remington. The Use of Student Generated Descriptions in the Identification of Mathematical Talent. (University of Arizona, 1971.) Dissertation Abstracts International 31A: 6280; June 1971. [Order No. 71-14,510]

Title: *"Unit Tests on Quadratic Equations, Complex Numbers, Linear Systems, Trigonometry, and Sequences, Series, and Limits"; "Concept-Formation Style Test"*

Developed by: T. E. Kieren

Content: assesses achievement on units on quadratic equations, complex numbers, linear systems, trigonometry, and sequences, series and limits

Format: not specified in article or abstract

Sample: 81 students in 4 sections of intermediate mathematics course in grade 11

Reliability: reliabilities for all measures used in study ranged from .71 to .83 ("deemed suitable")

Correlations: not specified in article or abstract

Validity: "Validities of the tests were assessed using content and face procedures and were deemed satisfactory."

References: Kieren, Thomas Ervin. The Computer as a Teaching Aid for Eleventh Grade Mathematics: A Comparison Study. (University of Minnesota, 1968.) Dissertation Abstracts 29A: 3526-3527; April 1969. [Order No. 68-17,690]

Kieren, Thomas E. Computer-Assisted Problem Solving in School Mathematics. *Journal for Research in Mathematics Education* 3: 99-112; March 1972.

Title: *"Attitudes Toward Teaching Mathematics"*

Developed by: E. G. Kindle

Content: assesses teacher's attitude toward the concepts of "teaching", "mathematics", and "teaching mathematics"

Format: semantic differential instrument

Sample: 403 elementary-school teachers, administrators, and lay assistants

Reliability: $r > .89$

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Kindle, E. Glenn. Evaluation of the 1969 Colorado Department of Education In-Service Program for Elementary School Mathematics Teachers. (University of Denver, 1971.) *Dissertation Abstracts International* 32B: 7172; June 1972. [Order No. 72-15,858]

Title: "Test on Proofs"

Developed by: I. L. King

Content: assesses sixth-grade students' achievement on proofs

Format: 25 items--6 proofs, 19 prerequisite items

Sample: 20 pupils in grade 6

Reliability: range for experimental and control groups, r = -.09 to .71 (pretest); .00 to .77 (posttest) (Hoyt reliability)

Correlations: not specified in references

Validity: criterion-referenced test

References: King, Irvin Leon. A Formative Developement of a Unit on Proof for Use in the Elementary School. (The University of Wisconsin, 1969.) Dissertation Abstracts International 31A: 680-681; August 1970. [Order No. 70-3584]

King, Irvin L. A Formative Development of a Unit on Proof for Use in the Elementary School. Technical Report No. 111. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1970. ERIC: ED 040 876. 401 pages.

Title: "*Test on Mathematical Systems*"

Developed by: J. E. Kirkpatrick

Content: assesses five objectives for teaching finite mathematical systems

Format: not specified in abstract

Sample: 300 sixth-grade pupils in 12 classes in six schools

Reliability: "precautions were taken to establish appropriate reliability and validity"

Correlations: not specified in abstract

Validity: see "Reliability"

Reference: Kirkpatrick, Joan Elizabeth. The Use of Finite Mathematical Systems to Achieve Selected Mathematics Objectives in Grade Six. (University of Minnesota, 1970.) *Dissertation Abstracts International* 32A: 306-307; July 1971. [Order No. 71-18,761]

Title: Diagnostic Measure of Mathematical Skills -- Kindergarten

Developed by: G. E. Knowlden

Content: assesses mathematics skills of kindergarten children

Format: not specified in abstract

Sample: 80 kindergarten children

Reliability: "a relatively high degree of stability was established"

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Knowlden, Gayle Elizabeth. Teaching English Language and Mathematical Symbolism to Verbally Disadvantaged Kindergarten Children. (University of California, Los Angeles, 1966.) Dissertation Abstracts 27A: 3623-3624; May 1967. [Order No. 67-4503]

Title: *Instrument for Evaluating Survey Research Reports*

Developed by: R. L. Kohr

Content: used to evaluate reports of survey educational research--applied to reports of research in mathematics education

Format: 9 questions to be assigned rating of 1-5; "key points" for each aid in decision-making; additional explanatory data available. (Instrument included in article.)

Sample: 10 survey reports of research in elementary school mathematics (stratified random selection) rated by 9 judges in three groups

Reliability: All judges combined, r = .80; for 3 sets of judges, r = .80, .84, .95; for all judges with groups as strata, r = .91 (AOV internal consistency). Individual reliability, r = .32 for all judges combined; for 3 sets of judges, r = .57, .64, .86; for all judges with groups as strata, r = .78.

Correlations: no correlations with other instruments obtained

Validity: developed after synthesis of suggestions of experts; format parallels that of Suydam's instrument

References: Kohr, Richard L. and Suydam, Marilyn N. An Instrument for Evaluating Survey Research. *Journal of Educational Research* 64: 78-85; October 1970.

Suydam, Marilyn N. and Riedesel, C. Alan. *Interpretive Study of Research and Development in Elementary School Mathematics, Phase 1*. Volumes I, II, and III. University Park: The Pennsylvania State University, 1969. ERIC: ED 030 016, ED 030 017, ED 030 018. 250 pages, 328 pages, 227 pages.

Title: "*Achievement in Mathematics Test*"

Developed by: J. R. Kolb

Content: assesses mathematics achievement during instructional sequence in mathematics related to (or not related to) selected quantitative science behavior (science test also developed)

Format: 26 items

Sample: 11 fifth-grade classes

Reliability: r = .76 (stability); r = .92 (Kuder-Richardson formula 20 internal consistency)

Correlations: not specified in article or abstract

Validity: items correspond to tasks in a developed mathematics hierarchy

References: Kolb, John Ronald. The Contributions of an Instructional Sequence in Mathematics Related to Quantitative Science Exercises in Grade Five. (University of Maryland, 1967.) *Dissertation Abstracts* 28A: 3561-3562; March 1968. [Order No. 68-3370]

Kolb, John R. Effects of Relating Mathematics to Science Instruction on the Acquisition of Quantitative Science Behaviors. *Journal of Research in Science Teaching* 5: 174-182; June 1967.

Title:	"*Diagnostic Test on Division*"
Developed by:	R. Kurtz
Content:	diagnostic; assesses various computational skills in division
Format:	16 items (items included in article)
Sample:	343 pupils in grade 4; readministered to same pupils in grade 5
Reliability:	not specified in article
Correlations:	not specified in article
Validity:	preliminary version submitted to a board of professional mathematics educators and then revised to reflect their reactions
Reference:	Kurtz, Ray. Fourth-Grade Division: 'How Much Is Retained in Grade Five. *Arithmetic Teacher* 20: 65-71; January 1973.

Title: GAS-50 (Geometry Attitude Survey)

Developed by: F. G. Labaki

Content: measures attitude toward geometry at middle- and high school levels

Format: 54 pairs of Likert-type statements; 5 subscales subjectively identified and then verified by correlational analyses) on interest-pleasure, difficulty, relevance, comparison with other mathematics, and teacher influence

Sample: Field test, administered to 318 middle- and high school students. Different combinations of statements were tested for reliability via the Kuder-Richardson formula 20 coefficient; those with the best set of reliabilities across subscales and total scale selected for final form. Final form administered to new sample of 319 students in middle- and high schools.

Reliability: ranged from r = .67 to .84 on five subscales; r = .92 on total scale (KR-20)

Correlations: not specified in abstract

Validity: Professional educators and students from middle- and high-school levels were contacted for contributing sample items, ideas, and concepts to be incorporated in the scale. 36 students involved in field test were interviewed, their ratings of items compared with their written responses to establish a coefficient of validity.

Reference: Labaki, Felix George. The Development of a Scale for Measuring the Attitudes of Middle-School and High-School Students Toward Geometry. (State University of New York at Buffalo, 1973.) Dissertation Abstracts International 34A: 1704-1705; October 1973. [Order No. 73-23,860]

Title: *"Tests on Geometry and Number Concepts"*

Developed by: R. A. Laing

Content: geometry, number concepts

Format: three tests, each subdivided into subtests on computational skills, comprehension, and applications

Sample: 526 students in 20 classes in grade 8

Reliability: r = .78 to .84

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Laing, Robert Andrew. Relative Effects of Masses and Distributed Scheduling of Topics on Homework Assignments of Eighth Grade Mathematics Students. (The Ohio State University, 1970.) *Dissertation Abstracts International* 31A: 4625; March 1971. [Order No. 71-7498]

Title: A Developmental Index of Numerical Cognitive Performance

Developed by: J. C. Larson

Content: three subtests--classification, seriation, analogies--each "divided into a gradient of six levels of perceptual structure" (which are specified)

Format: 36 pictorial, multiple-choice items; individually administered

Sample: 46 pupils in kindergarten, grades 1 and 2

Reliability: $r = .84$ (Kuder-Richardson formula 20)

Correlations: see "Validity"

Validity: Reviewed existing measures and Piaget's theory, adapting these basic constructs to a simplified test form. Administered concurrently with several measures, including Wechsler Intelligence Scale for Children, Verbal Scale (IQ, $r = .41$; Arithmetic subtest, $r = .58$); standard Piagetian number development tasks in conservation and seriation ($r = .70$). "From the pattern of correlations with concurrent measures, the test was characterized as a homogeneous measure of numerical cognitive performance highly related to Piagetian number constructs, and correlating significantly with arithmetic ability over and above its relationship to IQ ability."

Reference: Larson, John Charles. A Developmental Index of Numerical Cognitive Performance. (The University of Michigan, 1971.) Dissertation Abstracts International 32A: 6208; May 1972. [Order No. 72-14,919]

Title: Basic Algebraic Concepts Test

Developed by: D. I. Lazar

Content: assesses understanding of basic algebraic concepts by prospective teachers of secondary school mathematics

Format: 35 multiple-choice items (Form D)

Sample: Form A, 109 items, administered, revised by "experts". Item analysis of the 70 items of Form B to establish high degrees of reliability and content validity; 32 items deleted, 12 new items inserted. Form C, 50 items, administered. Form D, 35 items, administered to 170 prospective teachers of secondary school mathematics.

Reliability: r = .80 (Form C), .84 (Form D) (Kuder-Richardson formula). Mean discriminatory power improved from .10 to .35; mean difficulty level improved from .37 to .46.

Correlations: Pearson Product-Moment correlations significant (at .01 level) between test scores and qualitative self-evaluation, quantitative self-evaluation, semester hours completed, predicted mean score. SAT scores (quantitative and verbal) and qualitative self-evaluation (tested with multiple regression analyses), correlation .72 with test.

Validity: Representative selection of basic algebraic concepts secured; six major areas selected and 40 concepts derived from within these areas. Initial instrument constructed to test these concepts. Content validity and concurrent validity studied (see "Correlations").

Reference: Lazar, David I. The Development and Validation of an Instrument to Assess the Understanding of Basic Algebraic Concepts by Prospective Teachers of Secondary School Mathematics. (Temple University, 1972.) Dissertation Abstracts International 33A: 1517; October 1972. [Order No. 72-20,196]

Title: "Ability to Read Concise Mathematics Language"

Developed by: J. W. LeDuc

Content: measures some abilities important in the reading of mathematics--comparison of paragraphs, use of some ordinary words whose mathematical meanings are very precise, drawing of inferences, use of modifiers, and classification

Format: strands of questions referring to definition or example

Sample: Pilot test, two testing sessions followed by revisions. Final edition given to 203 students in second-year high school algebra.

Reliability: not specified in abstract (Kuder-Richardson formula 21)

Correlations: not specified in abstract

Validity: "Several validity checks were reported [in the dissertation]."

Reference: LeDuc, John William. A Measure of Ability to Read Concise Mathematics Language. (University of Illinois at Urbana-Champaign, 1971.) Dissertation Abstracts International 32A: 5655; April 1972. [Order No. 72-12,264]

Title: *"Achievement in Modern Mathematics in Grades 4, 5, and 6"*

Developed by: S. J. LeJeune

Content: measures achievement in "modern" mathematics, grades 4-6

Format: 12 subtests, each for a major topic in the outline. Grade level norms in percentile form.

Sample: preliminary versions administered to two classes each in grades 4-6; final version administered to 20 classes each in grades 4-6 (1841 students)

Reliability: Test revised after item analyses following two administrations; grade 4, r = .92; grade 5, .93; grade 6, .95; total group, .95 (split-half method corrected by Spearman-Brown formula). "All evidence indicates that the test is a highly reliable instrument."

Correlations: not specified in abstract

Validity: test patterned after subject matter in the six series of textbooks (for grades 4-6) most frequently noted by state departments of education surveyed

Reference: LeJeune, Stanley Joseph. The Development of an Instrument to Determine Achievement in Modern Mathematics in Grades Four, Five, and Six. (The University of Mississippi, 1967.) *Dissertation Abstracts* 28A: 4383-4384; May 1968. [Order No. 68-2137]

Title: *Taxonomic Skills Achievement Test in Fractions*

Developed by: A. I. Levin

Content: assesses achievement with addition of fractions

Format: not specified in abstract

Sample: 60 pupils in two grade 5 classes

Reliability: r = .77

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Levin, Alvin Irving. The Use of Taxonomic Programming as Applied to the Teaching of Fractions in Grade Five. (University of California, Los Angeles, 1968.) *Dissertation Abstracts* 29A: 1782-1783; December 1968. [Order No. 68-16,554]

Title: *Mathematics Opinionnaire*

Developed by: M. F. Levine

Content: measures mathematical confidence relative to the attainment of certain objectives in mathematics for secondary school teachers

Format: not specified in abstract

Sample: Pilot study, three groups of secondary school teachers. Administered to 53 teachers in institute.

Reliability: r = .80 (split-half technique), pilot study.

Correlations: Between posttest scores of mathematical confidence and mathematical competence, r = .35.

Validity: In the pilot study, "coefficients of correlation between scores on the instrument and instructors' ratings failed to provide a conclusive answer to the validity question".

Reference: Levine, Maita Faye. A Study of Mathematical Confidence Relative to the Attainment of Certain Objectives of the In-Service Institute in Mathematics for Secondary School Teachers, University of Cincinnati, 1969-1970. (The Ohio State University, 1970.) *Dissertation Abstracts International* 32A: 287-288; July 1971. [Order No. 71-18,045]

Title:	"Taxonomized Examination for a Geometry for Elementary Teachers Course"
Developed by:	R. A. Little
Content:	measures effectiveness of a geometry course for elementary teachers as proposed by CUPM guidelines with behavioral objectives modeled on Bloom's Taxonomy
Format:	not specified in abstract
Sample:	62 students in three sections of a course on geometry for elementary teachers
Reliability:	not specified in abstract
Correlations:	Intercorrelations calculated between pairs of descriptors and between descriptors and all scales of the Taxonomized Examination; four predictors of academic achievement correlated .42 to .60 with the Examination.
Validity:	Test constructed on the basis of behavioral objectives for the course. Hierarchical clustering scheme analysis between pairs of subtests revealed that data related to all six Taxonomy levels on the test supported the stated hierarchy of the Taxonomy only for knowledge, comprehension, application, and analysis subtests.
Reference:	Little, Richard A. A Taxonomic Approach to Measuring Achievement in Mathematics 223--Geometry for Elementary Teachers. (Kent State University, 1971.) Dissertation Abstracts International 32A: 6105; May 1972. [Order No. 72-15,945]

Title: Contemporary Mathematics: A Test for Teachers (Contemporary Mathematics Test)

Developed by: R. O. Massie

Content: measures content preparation necessary for teaching "modern" mathematics

Format: 40 items

Sample: Three forms administered to 206 prospective teachers; items analyzed. 40 test items organized into final test; administered to 273 prospective teachers in 29 teacher-training institutions in eight states and to 58 teachers with experience in teaching modern mathematics courses.

Reliability: not specified in abstract

Correlations: Scores correlated significantly with quantitative, verbal, and total test scores on the Henmon-Nelson Tests of Mental Ability, College Level.

Validity: Jury of 12 "leading" mathematics educators aided in developing list of characteristics distinguishing modern from traditional mathematics; test items then prepared. Factor analysis resulted in indentification of two factors, "memory" and "reasoning".

Reference: Massie, Ronald Owen. The Construction and Use of Test to Evaluate Teacher Preparation in Modern Mathematics. (The University of Nebraska Teachers College, 1967.) Dissertation Abstracts 28A: 4027-4028; April 1968. [Order No. 68-3793]

Title: "Understandings of Selected Concepts of Logic"

Developed by: R. S. Matulis

Content: measures understandings of implications and of conjunction, disjunction and quantifiers

Format: two parts; 33 multiple-choice items

Sample: 46 fourth- through twelfth-grade classes

Reliability: not specified in abstract

Correlations: not specified in abstract

Validity: "Validity was checked by means of (1) a jury of experts in mathematics, education and/or logic, (2) a pilot study, (3) computer analyses, and (4) a test of reading level."

Reference: Matulis, Robert Stanley. A Survey of the Understandings of Selected Concepts of Logic by 8-18-Year-Old Students. (The University of Florida, 1969.) Dissertation Abstracts International 31A: 1079; September 1970. [Order No. 70-14,901]

Title: "Inventory of Attitudes Toward Elementary School Mathematics"

Developed by: W. C. McClure

Content: assesses attitude of teachers and students toward mathematics content, problem solving, teacher and facilitative factors

Format: four sub-sections

Sample: 97 elementary school teachers, 25 pre-service elementary school teachers, 194 ninth- and twelfth-grade students

Reliability: not specified in abstract

Correlations: see "Validity"

Validity: Correlation with Dutton attitude scales, .44. "Both attitude toward content in elementary school mathematics and attitude toward problem solving are valid measures of attitude toward elementary school mathematics as indicated by high positive correlations with the Dutton scales (r = .49 and .51)." "Attitudes toward the teacher and certain facilitative factors are poor indices of attitude toward mathematics in general as indicated by insignificant positive correlations with Dutton scale scores (r = .10 and .18)." "Mathematics aptitude is a strong predictor of attitude toward elementary school mathematics as measured by the inventory and attitude toward problem solving specifically."

Reference: McClure, Wesley Cornelious. A Multivariate Inventory of Attitudes Toward Selected Components of Elementary School Mathematics. (University of Virginia, 1970.) Dissertation Abstracts International 31A: 5941-5942; May 1971. [Order No.71-6640]

Title: The Proof Construction Test, Form B

Developed by: R. E. McCoy

Content: assesses ability in constructing a deductive proof in mathematics

Format: "consists of several simple axiomatic systems for the student to read and several theorems for him to prove"

Sample: Form A administered in pilot study with two classes of elementary education majors; revised. Form B administered to 139 elementary education majors in four classes.

Reliability: r = .59, Form A; r = .80, Form B.

Correlations: correlated with CEEB scores and high school average in mathematics

Validity: not specified in abstract

Reference: McCoy, Ronald Eugene. A Study of the Effects of Three Different Strategies of Proof Instruction and Background Factors of Elementary Education Majors for Success in Constructing Deductive Proof in Mathematics. (The Pennsylvania State University, 1971.) Dissertation Abstracts International 32A: 5091-5092; March 1972. [Order No. 72-9501]

Title: *Course Objective Test: Advanced Algebra*

Developed by: J. A. McIntosh

Content: assesses achievement on first-semester advanced algebra objectives

Format: 18 pairs of items

Sample: four sections of second-year-algebra students

Reliability: not specified in abstract

Correlations: not specified in abstract

Validity: List of objectives obtained by soliciting responses from 26 mathematics educators who were "determined to be experts" by the researcher. Two test items were formulated for each content objective; items evaluated relative to test design and content by 11 mathematics educators "who were well-versed in test design and secondary mathematics content. Based on their evaluation, final test developed.

(A "Semester Test" was also developed, "designed to measure achievement of concepts and skills similar to those which were taught in each of the sections of advanced algebra".)

Reference: McIntosh, Jerry Allen. A Comparison of Student Achievement Relative to a Modern and Traditional Third Semester Course in High School Algebra. (Indiana University, 1964.) *Dissertation Abstracts* 25: 4563; February 1965. [Order No. 65-401]

Title: "Cognitive Scale of Attitudes Toward Mathematics"

Developed by: E. C. Mealy

Content: assesses the cognitive or belief component of mathematics attitude relative to four values--value of mathematics to our present culture, in everyday life, in planning a future career, and as a recreational pastime; used with the Aiken-Dreger and Dutton attitude scales (which measure the affective or feeling component of mathematics attitude)

Format: Likert format, five-choice response

Sample: 240 students in grade 7

Reliability: r = .69 for Aiken-Dreger, Dutton, and developed instrument combined (test-retest)

Correlations: Cognitive scale correlated about .60 with both of the affective scales when corrected for attenuation. (Aiken-Dreger and Dutton scales correlated highly, about .89.)

Validity: see "Correlations"

Reference: Mealy, Edward Clark. An Evaluation of the Use of Films as an Aid to Changing Students' Attitudes Toward Mathematics. (George Peabody College for Teachers, 1970.) *Dissertation Abstracts International* 31B: 4852; February 1971. [Order No. 71-4264]

Title: Student Confidence Level of Academic Ability

Developed by: J. W. Mehl

Content: assesses student's level of confidence in his academic ability

Format: interview setting

Sample: students in grades 1-6

Reliability: r = .70

Correlations: scale scores significantly related to mathematics achievement percentile scores

Validity: developed "after study of the literature of Brookover and others"

Reference: Mehl, John Walter. Parental Attitude Toward the School, Student Confidence Level of Academic Ability, Selected Indices of Student Achievement: A Comparative Study of Relationships. (Michigan State University, 1973.) Dissertation Abstracts International 34A: 1099-1100; September 1973. [Order No. 73-20,378]

Title: "Test of Mathematical Creativity"

Developed by: R. W. Meyer

Content: measures observable mathematical creativity

Format: One part fixed--criteria which describe aspects of mathematical creativity in terms of observable behaviors: introducing a goal, identifying a property, seeking a relationship, seeking a generalization, reaching a mathematically elegant product, modifying the task. Other part is a mathematics problem to be worked, chosen to fit the needs of an experiment.

Sample: videotapes from one first-grade class

Reliability: average overall interscorer agreement, .87; overall interscorer agreements on five of the six criteria and on the pseudocriterion, .61 to 1.00 (third criterion, .43).

Correlations: correlations with Torrance Tests of Creative Thinking all non-significant and negative

Validity: criteria "passed a face validation procedure in which they were judged by seven professors of mathematics"

Reference: Meyer, Rochelle Wilson. The Identification and Encouragement of Mathematical Creativity in First Grade Students. Technical Report No. 112. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1966. ERIC: ED 038 292, 293, 294. 92 pages, 96 pages, 84 pages.

Meyer, Rochelle Wilson. The Identification and Encouragement of Mathematical Creativity in First Grade Students. (The University of Wilson, 1969.) Dissertation Abstracts International 31B: 809-810; August 1970. [Order No. 70-3627]

Title: *Elementary Mathematics Unit Content Test*

Developed by: D. D. Miller

Content: assesses achievement on unit in grade 6

Format: not specified in abstract

Sample: 215 pupils in grade 6

Reliability: "Validity and reliability of this instrument were established."

Correlations: not specified in abstract

Validity: see "Reliability"

Reference: Miller, Daniel David. The Effect of Automated Marking on Sixth Graders Mathematics Achievement. (Arizona State University, 1970.) *Dissertation Abstracts International* 31A: 2740; December 1970. [Order No. 70-24,406]

Title: Attitude and Interest Inventory

Developed by: D. D. Miller

Content: assesses attitudes toward mathematics

Format: not specified in abstract

Sample: 215 pupils in grade 6

Reliability: "Validity and reliability of this instrument were established."

Correlations: not specified in abstract

Validity: see "Reliability"

Reference: Miller, Donald Donavon. The Affective Influence of a Marking Machine on an Elementary Classroom. (Arizona State University, 1970.) Dissertation Abstracts International 31A: 2740-2741; December 1970. [Order No. 70-24,407]

Title: "Reasoning Test in Plane Geometry"

Developed by: I. M. Miller

Content: assesses reasoning in a (plane) geometric situation

Format: 25 items

Sample: Set of 10 geometric problems each having 25 questions developed, using complete-incomplete answer structures; administered to students; 50 items selected. Each set of 25 items structured in two forms, one multiple-choice and one controlled-choice. Administered in 1961 and 1962.

Reliability: 1961 administration: r = .36 to .72, computed for each form of every set (Kuder-Richardson formula 20); Rulon coefficients ranged from .26 to .80. Considered as a single instrument, r = .69 to .77 (Kuder-Richardson formula 20); Rulon coefficients, .65 to .85. 1962 administration: r = .59 to .61 (Kuder-Richardson formula 20); Rulon coefficients, .66 to .69.

Correlations: not specified in abstract

Validity: original items submitted to three "experts" for criticism

Reference: Miller, Isabel Maria. Construction and Evaluation of a Reasoning Test in Plane Geometry. (University of Colorado, 1963.) Dissertation Abstracts 34: 4586; May 1964. [Order No. 64-1934]

Title: "Test on Logical Inference Patterns"

Developed by: W. A. Miller

Content: measures acceptance or recognition of the six logical inference patterns

Format: 120 items (24 subtests, each containing five items, determined by six pattern and four content variables)

Sample: 25 students each from grades 8, 10, and 12 in four school systems and 360 students in one school system

Reliability: r = .91 (grade 8), .92 (grade 10), .93 (grade 12) (Hoyt reliability coefficient)

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Miller, William Anton. The Acceptance and Recognition of Six Logical Inference Patterns by Secondary Students. (The University of Wisconsin-Madison, 1968.) Dissertation Abstracts 29A: 1685-1686; December 1968. [Order No. 68-13,651]

Title: "Test on Hyperbolic Geometry"

Developed by: B. A. Mitchell

Content: measures achievement on the role of components of a mathematics system, proof and inference patterns, and operating in an unfamilir mathematical system

Format: not specified in abstract

Sample: 6 geometry classes

Reliability: r = .56 (Kuder-Richardson formula 20)

Correlations: not specified in abstract

Validity: panel of mathematicians and mathematics educators judged the content validity

Reference: Mitchell, Bruce Alex. The Effect of a Teacher-Developed Unit in Hyperbolic Geometry on Structural Objectives in Tenth Grade Geometry. (The Ohio State University, 1972.) Dissertation Abstracts International 33A: 5978-5979; May 1973. [Order No. 73-11,544]

Title: "Test on Exponents"

Developed by: W. B. Moody, R. B. Bausell, and J. R. Jenkins

Content: measures achievement for lessons on exponents

Format: 20 items--two items to measure each of 10 instructional objectives (2 sample items included in article)

Sample: 249 pupils in grade 4

Reliability: r = .89 (split-half coefficient, Spearman-Brown formula)

Correlations: r = .55 with PMA IQ scores

Validity: not specified in article

Reference: Moody, William B.; Bausell, R. Barker; and Jenkins, Joseph R. The Effect of Class Size on the Learning of Mathematics: A Parametric Study with Fourth-Grade Students. *Journal for Research in Mathematics Education* 4: 170-176; May 1973.

Title: *OScAR (STEM): Observation Schedule and Record, Student Teacher Elementary Mathematics*

Developed by: J. N. Moorhouse (from instrument developed by Mitzel and Medley)

Content: assesses mathematics vocabulary, teaching media, and interaction initiated by teacher

Format: three sections

Sample: 19 pre-service elementary teachers

Reliability: observer agreement, .96

Correlations: correlation of MTAI and OScAR(STEM) scores neither positive nor significant (Pearson product-moment coefficient)

Validity: follows procedures used in original OScAR instrument

Reference: Moorhouse, John Nelson. Student-Appointed Goals Applied to the Evaluation of Student Teacher Mathematics Instruction. (The Pennsylvania State University, 1970.) *Dissertation Abstracts International* 32A: 823-824; August 1971. [Order No. 71-21,778]

Title:	"Taxonomic Achievement Examination in Mathematics Education"
Developed by:	M. L. Morford
Content:	assesses relationship between selected cognitive descriptors and achievement in mathematics education course
Format:	not specified in abstract
Sample:	126 pre-service elementary teachers in a mathematics education course
Reliability:	not specified in abstract
Correlations:	Intercorrelations calculated among cognitive descriptors and between descriptors and all scales of the instrument; factor analysis procedures also used. Grade point averages correlated significantly with all scales of the instrument; subtests of a mathematics test (also developed for the study) were not significantly correlated with all scales. Other correlations specified in abstract.
Validity:	see "Correlations"
Reference:	Morford, Myron Lee. A Taxonomic Approach to the Prediction of Achievement in Mathematics Education for Prospective Elementary Teachers. (Kent State University, 1969.) Dissertation Abstracts International 30A: 4314-4315; April 1970. [Order No. 70-5964]

Title: "Non-Verbal Attitude and Achievement Index for Mathematics"

Developed by: T. R. Nealeigh

Content: measures attitude and achievement proneness in mathematics, using concepts of symmetry, similarity, order, and pattern

Format: 310 items consisting of pairs of pictures, with one of four mathematical concepts in one picture but not in the other; non-reading, non-verbal

Sample: Administered to 171 pupils in grade 3 and 164 pupils in grade 7; items analyzed. Second set of tests constructed; "selected portion" of original two grade groups retested with modified version.

Reliability: item discrimination established by retest procedures and further substantiated by split-half correlation coefficient

Correlations: not specified in abstract

Validity: verified by determining the degree and discrimination of each test item, by grade and attribute group; "the test is structured to measure what it is designed to measure"

Reference: Nealeigh, Thomas Richard. Development and Validation of a Non-Verbal Attitude and Achievement Index for Mathematics. (The Ohio State University, 1967.) Dissertation Abstracts 28A: 3567; March 1968. [Order No. 68-3039]

Title: "Group and Individual Tests Based on Piaget's Concepts of Number and Length Conservation"

Developed by: R. J. Nelson

Content: assesses achievement on concepts of conservation of number and length

Format: Group Test (GT), 12 questions, pencil-and-paper, 30 minutes to administer. Individual Test (IT), 16 questions, individual, 15 minutes to administer.

Sample: 163 first grade pupils, with GT or IT administered along or both administered with order reversed

Reliability: Group Test, r = .66 (internal), .71 (test-retest) (n = 85). Individual Test, r = .86 (internal).

Correlations: Correlated with arithmetic achievement test (AT) scores; all correlations between GT, IT, and AT were significant at .001 level, thus suggesting "that GT and IT have ability to predict arithmetic achievement".
Correlation between conservation of length subtests on GT and IT, .41; correlation between conservation of number subtests, .36. Correlations of eight analogous items on GT and IT ranged from .54 to .88.

Validity: "To examine the content validity of the GT and to explore particular conservation items on the GT, a Piagetian-oriented test, IT, designed to be administered to one child at a time, was used... IT was based on the same concepts as the GT and had previously demonstrated potential as a predictor of first-grade arithmetic achievement."

Reference: Nelson, Robert John. An Investigation of a Group Test Based on Piaget's Concepts of Number and Length Conservation and Its Ability to Predict First-Grade Arithmetic Achievement. (Purdue University, 1969.) Dissertation Abstracts International 30A: 3644; March 1970. [Order No. 70-3948]

Title: "Test on Decimals"

Developed by: M. P. Northcutt

Content: decimals

Format: not specified in abstract

Sample: eight fifth-grade classes in four schools

Reliability: "A pilot study was conducted to determine the reliability of these measuring instruments."

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Northcutt, Mary Palmer. The Comparative Effectiveness of Classroom and Programmed Instruction in Teaching of Decimals to Fifth Grade Students. (George Peabody College for Teachers, 1963.) Dissertation Abstracts 24: 5091-5092; June 1964. [Order No. 64-5077]

Title: "Pre- and Posttests on Class Concepts"

Developed by: S. M. Nowak

Content: measures attainment of class concepts

Format: not specified in abstract

Sample: 210 pupils in grade 3

Reliability: pretest, r = .91; posttest, r = .87 (Kuder-Richardson formula 20)

Correlations: Relationship with IQ, reading, vocabulary, language, mathematical concepts, arithmetic problem-solving skills, and initial classificatory abilities examined. Prior classification experiences were significantly associated with categorizing skills; less related abilities were general intelligence and mathematical concepts.

Validity: not specified in abstract

Reference: Nowak, Stanley Marion. The Development and Analysis of the Effects of an Instructional Program Based on Piaget's Theory of Classification. (State University of New York at Buffalo, 1969.) *Dissertation Abstracts International* 30A: 1875; November 1969. [Order No. 69-19,021]

Title: "Test to Assess Quantitatively Analytic Style"

Developed by: D. A. Oakley

Content: provides measure for discriminating between quantitatively analytic and non-quantitatively analytic students

Format: multiple-choice items

Sample: 140 ninth-grade students in one school

Reliability: r = .67

Correlations: between test and personal interview, picture-viewing task, card-sorting task (r = .73), evaluation by teachers, IQ, and school grades

Validity: Face validity established by judging panel, based on adherence to defined cognitive styles. Practical validity based on science grades investigated but not deemed useful. Factor analysis identified two general factors; correlations between instruments within the two factor groups significant at .01 level.

Reference: Oakley, Donald Lilly. An Investigation of the Quantitatively Analytic Cognitive Style of Ninth Grade Students. (Cornell University, 1971.) Dissertation Abstracts International 32A: 6826; June 1972.

Title: "*Test for Probability Concepts*"

Developed by: R. H. Ojemann, E. J. Maxey, and B. C. F. Snider

Content: assesses probabilitv concept attainment

Format: two tests--25 questions involving two groups of colored objects; two 12-part tests with objects pictured on cards (specifics included in article)

Sample: 41 pupils in two second-grade classes

Reliability: first test, r = .85 (Kuder-Richardson formula 21); second test, r = .72 (Kuder-Richardson formula 21)

Correlations: not specified in article

Validity: not specified in article

Reference: Ojemann, Ralph H.; Maxey, E. James; and Snider, Bill C. F. The Effect of a Program of Guided Learning Experiences in Developing Probability Concepts at the Third Grade Level. *Journal of Experimental Education* 33: 321-330; June 1965.

Title: "Test on Multiplication and Division with Fractions"

Developed by: J. A. O'Neill

Content: multiplication and division with fractions

Format: not specified in abstract

Sample: six fifth-grade classes in two schools

Reliability: r = .96 (Spearman-Brown)

Correlations: not specified in abstract

Validity: developed "following recommended procedures for establishing validity and reliability"

Reference: O'Neill, Jane Anne. An Analysis on Selected Variables of the Effect of a Systems Approach to Teaching Specific Mathematical Skills to Fifth Grade Students from a Disadvantaged Area. (The University of Connecticut, 1970.) Dissertation Abstracts International 31A: 6286; June 1971. [Order No. 71-16,020]

Title: *Relation Test*; *Conservation of Matching Relations Test*; *Transitivity of Matching Relations Test*

Developed by: D. T. Owens and L. P. Steffe

Content: measures knowledge of matching relations, ability to conserve the relations, and proficiency in making inferences using the transitive property of the relations

Format: Individually administered; concrete materials used. Relation Test and Conservation Test, same 18 items; Transitivity Test, 18 items. (Source for tests given in article.)

Sample: 51 kindergarten pupils

Reliability: Conservation Test, r = .94 (Kuder-Richardson formula 20. (Since Transitivity Test data was available for only 14 children, a reliability study was not considered feasible.)

Correlations: not specified in article

Validity: based on analysis of related research procedures

References: Owens, Douglas T. and Steffe, Leslie P. Performance of Kindergarten Children on Transitivity of Three Matching Relations. *Journal for Research in Mathematics Education* 4: 141-154; May 1972.

Owens, Douglas Timothy. The Effects of Selected Experiences on the Ability of Disadvantaged Kindergarten and First Grade Children to Use Properties of Equivalence and Order Relations. (University of Georgia, 1972.) *Dissertation Abstracts International* 33A: 5042; March 1973. [Order No. 73-5754]

Title: A Test of Basic Understandings in Arithmetic

Developed by: A. Pace

Content: assesses understandings related to whole numbers and fractions, operations with whole numbers and fractions, measurement, and decimals

Format: 63 multiple-choice items; 45-minute time limit (copy of test in article)

Sample: 2692 pupils in sixth year, in 60 English schools; 3206 pupils in grade 5 and 6 in 47 New York schools

Reliability: not specified in article

Correlations: not specified in article

Validity: Basic mathematics concepts listed from three recent English and three recent American arithmetic series, used as guide in constructing test items. Adapted from Glennon's "Test of Basic Mathematical Understandings".

Reference: Pace, Angela. Understanding of Basic Concepts of Arithmetic: A Comparative Study. Journal of Educational Research 60: 107-120; November 1966.

Title: "*Tests of Conservation*"

Developed by: D. L. Peters

Content: assesses conservation of number, difference, and area

Format: Piagetian tasks using standard procedures similar to those of Rothenberg; neutral materials. Pre-, post-, and retention test forms.

Sample: 131 kindergarten pupils

Reliability: Number conservation test, r = .75 (Cronbach's alpha); difference conservation test, r = .83 (Cronbach's alpha); area conservation test, r = .55 (test-retest, n = 30).

Correlations: number conservation test scoring method "consistently correlated in the .90s with a scale based on Piaget's stages of development"

Validity: see "Format" and "Correlations"

References: Peters, Donald Louis. Piaget's Conservation of Number: The Interaction of Language Comprehension and Analytic Style with Three Methods of Training. *Dissertation Abstracts* 29A: 3878-3879; May 1969. [Order No. 69-8239]

Peters, Donald L. Discovery Learning in Kindergarten Mathematics. *Journal for Research in Mathematics Education* 1: 76-87; March 1970.

Peters, Donald L. Verbal Mediators and Cue Discrimination in the Transition from Nonconservation to Conservation of Number. *Child Development* 41: 707-721; September 1970.

Title: "*Test of Mathematical Knowledge*"

Developed by: D. L. Peterson

Content: assesses knowledge and skill in mathematics of mentally retarded children

Format: questions and tasks

Sample: 60 pupils aged 7-9 in school programs for educable and trainable retarded children

Reliability: "Reliability and validity established in pilot administration of test."

Correlations: not specified in abstract

Validity: see "Reliability"

Reference: Peterson, Daniel Loren. A Study of Mathematical Knowledge Among Young Mental Retardates. (University of Missouri-Columbia, 1967.) *Dissertation Abstracts* 29A: 104-105; July 1968. [Order No. 68-3642]

Title: "*Achievement Test in Geometry*"

Developed by: G. D. Peterson

Content: assesses intermediate-grade achievement in 18 topics in geometry

Format: 50 multiple-choice items per grade level

Sample: three potentially equivalent 50-item tests written to conform to blueprint, administered to 725 pupils in grades 4-6; on the basis of an item analysis, 50 items were selected for each grade level

Reliability: "difficulty and discrimination indices were high enough to select enough items, with some revision, to construct a potentially reliable test"

Correlations: not specified in abstract

Validity: "Blueprint" for test was constructed on the basis of a survey of the five major elementary mathematics textbook series. Content, ability-process, and statistical-specifications dimensions were determined.

Reference: Peterson, Gary Davis. The Preparation, Administration, and Interpretation of an Achievement Test in Geometry for Fourth, Fifth, and Sixth Grades. (University of Kansas, 1973.) *Dissertation Abstracts International* 34A: 3242; December 1973. [Order No. 73-30,858]

Title: "Posttests on Mathematics Achievement, Grade 8"

Developed by: J. C. Peterson

Content: assesses achievement in eighth-grade mathematics

Format: not specified in abstract

Sample: 18 eighth-grade classes

Reliability: $r > .92$

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Peterson, John Charles. Effect of Exploratory Homework Exercises Upon Achievement in Eighth Grade Mathematics. (The Ohio State University, 1969.) Dissertation Abstracts International 30A: 4339; April 1970. [Order No. 70-6850]

Title: "*Test of Operational Skill in Arithmetic and Algebra*", "*Meaning and Understanding Test in Arithmetic*", and "*Vocabulary Knowledge Test*"

Developed by: C. Phillips

Content: assesses mathematical achievement of pre-service elementary teachers; see "Format"

Format: Operational Skill test, 25 problems (18 arithmetic problems on whole numbers, fractions, decimals, per cents, verbal problems and order of operations; 7 algebra problems on removal of parentheses, monomial factoring, proportion, and solving equations). Meaning and Understanding test, 24 problems (4 multiple choice) on number systems, computational steps using whole numbers, fractions, ratio, and decimals. Vocabulary test, 10 terms to define. (Examples given in article.)

Sample: 73 prospective elementary teachers, most of whom had only two years of high school mathematics

Reliability: Operational Skill test, r = .93; Meaning and Understanding test, r = .70; Vocabulary test, r = .96 (Kuder-Richardson formula 21)

Correlations: not specified in article

Validity: not specified in article

Reference: Phillips. Clarence. Approach to the Training of Prospective Elementary Mathematics Teachers. *Journal of Teacher Education* 19: 293-297; Fall 1968.

Title: "Tests on Addition of Rational Numbers"

Developed by: E. R. Phillips

Content: assesses attainment at each of 11 levels of a hierarchy for addition of rational numbers with like denominators

Format: Hierarchy test, 11 composite items consisting of three items testing the same subordinate task (33 items). Pretest on prerequisite skills, 24 items. Pretest on achievement, 11 items. Posttest and retention test on achievement. Transfer test on subtraction of rational numbers with like denominators.

Sample: Hierarchy test, 163 pupils in grades 4-6. Pretest I, 175 pupils in grade 4. Other tests, 142 pupils in grade 4.

Reliability: Hierarchy test, $r = .86$, except for textbook (.62) and random (.61) sequences; post-, retention, and transfer tests, $r > .90$ (Kuder-Richardson formula 20)

Correlations: not specified in article or abstract

Validity: indirect validation procedures used to assess pass-fail relationships: item difficulty, the AAAS approach, the Guttman technique, pattern analysis, and correlation analysis

References: Phillips, Ernest Ray. Validating Learning Hierarchies for Sequencing Mathematical Tasks. (Purdue University, 1971.) Dissertation Abstracts International 32A: 4249; February 1972. [Order No. 72-8008]

Phillips, E. Ray and Kane, Robert B. Validating Learning Hierarchies for Sequencing Matehmatical Tasks in Elementary School Mathematics. Journal for Research in Mathematics Education 4: 141-151; May 1973.

Title: *"Achievement Test in Mathematics"*

Developed by: F. Pigge and I. H. Brune

Content: assesses pre-service teacher's achievement in mathematics

Format: Two forms, 58 items each: 22 items on place value, structural properties, and various algorithms associated with whole numbers; 15 items on geometric concepts; 7 items on measurement concepts; and 14 items on fractional understanding. (Five sample items included in article.)

Sample: 66 pre-service elementary teachers

Reliability: r = .90 (test-retest, between forms)

Correlations: not specified in article

Validity: "constructed to have high content validity"; questions constructed from outline of course objectives

Reference: Pigge, Fred and Brune, Irvin H. Lectures Versus Manuals in the Education of Elementary Teachers. *Arithmetic Teacher* 16: 48-52; January 1969.

Title: "*Test on Properties of Commutativity, Identity Element, and Inverses*"

Developed by: R. W. Prielipp

Content: properties of commutativity, identity element, and inverses

Format: 18 questions; personal interview; half of the test situations were presented in a mathematical setting, half in a physical setting; one question on each of the three concepts was asked in each of six contexts

Sample: 774 ninth-grade elementary algebra students

Reliability: r = .72 (Hoyt reliability coefficient)

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Prielipp, Robert Walter. The Effect of Textbook, Sex, and Setting of the Problem on the Ability of First Year Algebra Students to Recognize Three Properties of an Abelian Group. (The University of Wisconsin, 1967.) *Dissertation Abstracts* 28A: 4545-4546; May 1968. [Order No. 67-16,997]

Title: *Individual Arithmetic Achievement Test for Educable Mentally Retarded Children Ages Six Through Nine*

Developed by: E. M. Pritchett

Content: measures arithmetic achievement of educable mentally retarded children aged six to nine

Format: 86 items (after final revision); individually administered; requires no reading or writing

Sample: Pool of 136 items created, approved by judges, evaluated in a pilot study. 98 items selected, administered to 314 EMR students aged 6-9 enrolled in special education classes in 18 school systems in four states. 12 items eliminated on basis of difficulty index.

Reliability: r = .99 (significant at .01 level) (Pearson Product-Moment test-retest Coefficient)

Correlations: with Metropolitan Achievement Test, Arithmetic Concepts and Skills Section of Primary I Battery, Form B, r = .88 (significant at .01 level) (Pearson Product-Moment Coefficient)

Validity: pool of items approved by panel of judges

Reference: Pritchett, Edward Milo. An Instrument of Measurement to Appraise the Arithmetic Abilities of Educable Mentally Retarded Children Ages Six Through Nine. (Colorado State College, 1965.) *Dissertation Abstracts* 26: 7120; June 1966. [Order No. 66-5995]

Title: *"Test on Fractions and Division"*

Developed by: B. B. Proger

Content: measures achievement on fractions and division problems

Format: 46 items

Sample: 80 pupils in three sixth-grade classes in 1 school

Reliability: r = .97 (split-halves coefficient of internal consistency, Spearman-Brown formula)

Correlations: Intercorrelations with anxiety measures, -.002 to -.30

Validity: not specified in article or abstract

References: Proger, Barton Bernard. The Relationship Between Four Testing Programs and the Resultant Achievement and Test Anxiety Levels of High- and Low-Previous Achievement Sixth-Grade Arithmetic Students. (Lehigh University, 1968.) *Dissertation Abstracts* 29A: 3880; May 1969.

Proger, Barton B.; Mann, Lester; Taylor, Raymond G., Jr; and Morrell, James E. Test Anxiety and Defensiveness Experimentally Induced by Four Conditions of Testing Arousal. *Journal of Experimental Education* 39: 78-83; Summer 1971.

Title:	*Creativity Test*
Developed by:	H. L. Prouse
Content:	assesses potential creativeness in mathematics
Format:	10 items--7, divergent thinking; 3, convergent thinking (three items included in article)
Sample:	14 seventh-grade classes (312 students)
Reliability:	r = .42 (split-half method). Discrimination indexes as a rule were lower for divergent-thinking items than for convergent-thinking items.
Correlations:	"Within-teachers" correlations between Creativity Test composite scores and "certain other variables" [Subject Preference Survey, Teacher Rating of Students as Creative, two tests from Guilford's Structure-of-Intellect model, Number Rules and Match Problems V] were small; they ranged from -.13 to .53." Correlations between Creativity Test composite scores and divergent-thinking items, .10 to .64; with convergent-thinking items, .01 to .23; with teacher ratings, .30; with intelligence test scores, .48. Correlations between fluency scores and originality scores generally high (.77 to .97); correlations between fluency scores on divergent-thinking items and socres on Number Rules and Match Problems V tests ranged from .01 to .41.
Validity:	Items "received unanimous endorsement by members of a jury composed of persons prominent in the fields of mathematics education and measurement and evaluation."
References:	Prouse, Howard L. The Construction and Use of a Test for the Measurement of Certain Aspects of Creativity in Seventh-Grade Mathematics. (State University of Iowa, 1964.) *Dissertation Abstracts* 26: 394; July 1965. [Order No. 65-500] Prouse, Howard L. Creativity in School Mathematics. *Mathematics Teacher* 60: 876-879; December 1967.

Title: Comprehensive Mathematics Inventory

Developed by: R. E. Rea and R. E. Reys

Content: assesses mathematical competencies of children entering school

Format: 200 items; administered in two sessions, 35-40 minutes total time; each item utilized materials that were assembled in a shoebox-sized kit. Two parts, seven subtests: Part I, money, 22 items; number, 50 items; vocabulary, 27 items; Part II, geometry, 34 items; measurement, 34 items; pattern identification, 7 items; recall, 20 items (with a few items from number and vocabulary); also six open-ended questions. (Sample items in articles (1), (2), (3) and (5); address for ordering test in article (1).)

Sample: Item pool of more than 300 items screened and given trials to provide construct validity and item clarity. Final form administered to 727 kindergarten pupils in 30 classes in 6 schools.

Reliability: r = .91 to .94, Part I; r = .83 to .87, Part II (Kuder-Richardson formula 20). Intercorrelations, r = .25 to .93 (Pearson product-moment correlations) (specified in article (2)). 87 per cent of variance could be accounted for by number subtest (r = .93). Factor analysis indicated that the CMI is a single factor instrument (subtests are not true subscales).

Correlations: see "Reliability"

Validity: Items derived from examination of materials prepared for elementary school programs, professional texts for teacher preparation, the recommendations of kindergarten and first grade teachers, suggestions of faculty with expertise in early childhood education, and the experiences of the researchers with young children. Topic outline prepared and validated.

References: (1) Rea, Robert E. and Reys, Robert E. The Comprehensive Mathematics Inventory: An Experimental Instrument for Assessing Youngsters Entering School. *Journal of Educational Measurement* 7: 45-47; Spring 1970.

(2) Reys, Robert E. and Rea, Robert E. The Comprehensive Mathematics Inventory: An Experimental

[Rea and Reys: continued]

Instrument for Assessing the Mathematical Competencies of Children Entering School. Journal for Research in Mathematics Education 1: 180-186; May 1970.

(3) Rea, Robert E. and Reys, Robert E. Mathematical Competencies of Entering Kindergarteners. Arithmetic Teacher 17: 65-74; January 1970.

(4) Rea, Robert E. and Reys, Robert E. Mathematical Competencies of Negro and Non-Negro Children Entering School. Journal of Negro Education 40: 12-16; Winter 1971.

(5) Rea, Robert E. and Reys, Robert E. Competencies of Entering Kindergarteners in Geometry, Number, Money, and Measurement. School Science and Mathematics 71: 389-402; May 1971.

Title: "View of Mathematics Inventory"

Developed by: W. L. Rettig, Sr.

Content: assesses teacher's view of mathematics

Format: 62-item inventory; three Likert-type scales on (I) Nature of Mathematics, (II) Mathematicians and Society, and (III) Mathematics and Society

Sample: First version, 100 items, administered to 72 secondary mathematics teachers; discriminatory power of items determined and 62 "best" items selected. Revised version administered to 253 secondary school teachers; 14 additional items eliminated.

Reliability: Scale I, r = .51; Scale II, r = .69; Scale III, r = .52; entire inventory, r = .72

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Rettig, William Leo, Sr. Views of Mathematics Held by a Selected Group of Secondary Mathematics Teachers in Pennsylvania. (The Ohio State University, 1971.) Dissertation Abstracts International 32A: 3571; January 1972. [Order No. 72-4620]

Title: Prerequisite Skills Test: Graphs; Graph Test

Developed by: C. W. Riggs

Content: Prerequisite Skills Test Assesses achievement of skills necessary for use of programmed text on graphs; Graph Test measures achievement in graph interpretation

Format: 70 multiple-choice items (20 prerequisite items, 50 criterion items)

Sample: 393 pupils in grades 4 and 5 (14 classes)

Reliability: Prerequisite Skills Test, r = .80 (test-retest, n = 83); Graph Test, r = .82 (test-retest)

Correlations: "Predictions of performance for the posttest of the Graph Test can be made from IQ scores (r = .58) ...[and] from the Prerequisite Skills Test (r = .72)."

Validity: "Content validity established by preparing the program to teach the skills of graphic interpretation tested by the graph test. A panel of nine experts, including nine specialists in curriculum and instruction work, used to ascertain the curricular validity of the content."

References: Riggs, Corinne Whitlow. The Construction and Evaluation of a Programmed Text on the Interpretation of Graphs for Grade Five. (University of California, Los Angeles, 1966.) Dissertation Abstracts 27A: 2748; March 1967. [Order No. 67-457]

Dutton, Wilbur H. and Riggs, Corinne Whitlow. Programmed Instruction on Graphs With Implications for Curriculum Improvements. California Journal of Educational Research 20: 8-15; January 1969.

Title: Achievement Test (AT): Mean Value Theorem for Derivatives

Developed by: R. F. Riggs

Content: assesses achievement on understanding of the Mean Value Theorem

Format: 38 multiple-choice items

Sample: three classes in grade 9, four classes in grade 12

Reliability: r = .60 to .77 (Kuder-Richardson formula 20); point-biserial correlations showed that 26 of the 38 items discriminated between high and low achievers

Correlations: not specified in abstract

Validity: content validity "estimated from a comparison with the operationalized objectives for the unit"

Reference: Riggs, Richard Forrest. The Mean Value Theorem as a Topic for Calculus in the Ninth Grade. (Rutgers - The State University, 1968.) Dissertation Abstracts 29A: 2044; January 1969. [Order No. 69-1056]

Title: *"Test on Selected Mathematical Principles and Relationships"*; *"Rating Scale on Teaching Method"*

Developed by: H. C. Robertson

Content: Test measures achievement on "general mathematics" and understanding of selected mathematical principles and relationships. Rating scale evaluates degree to which teacher carried out "expository" or "discovery" method of instruction.

Format: Test, 150 items, two forms. Rating scale, six categories with rating of 1 to 5.

Sample: Test, 374 pupils in 16 fourth-grade classes. Rating scale, pretested with independent observation of 11 teachers by two observers.

Reliability: Test, r = .94. Rating scale, r = .95 (Rho).

Correlations: not specified in abstract or article

Validity: not specified in abstract or article

References: Olander, Herbert T. and Robertson, Howard C. The Effectiveness of Discovery and Expository Methods in the Teaching of Fourth-Grade Mathematics. *Journal for Research in Mathematics Education* 4: 33-44; January 1973.

Robertson, Howard Charles. The Effects of the Discovery and Expository Approach of Presenting and Teaching Selected Mathematical Principles and Relationships to Fourth Grade Pupils. (University of Pittsburgh, 1970.) *Dissertation Abstracts International* 31A: 5278-5279; April 1971. [Order No. 71-8785]

Title: "Test on Motivation for School Achievement"

Developed by: I. L. Russell

Content: assesses motivation for school learning

Format: 30 items, yes-no response

Sample: Preliminary 50-item test administered to 100 ninth-grade boys; 24 least discriminating items eliminated. 32 additional items constructed, administered to 100 ninth graders; revised. Final form given to 100 ninth graders. (Test included in article.)

Reliability: r = .95 (split-half coefficient, Spearman-Brown formula). Tetrachoric correlations specified in article; range, .45 to .95.

Correlations: motivation scores correlated with California Achievement Test, Total Arithmetic subtest, .60 (Product-moment correlation (with reading and language subtests, .72, .69; with total test, .71)

Validity: 24 experienced teachers asked to construct "yes" and "no" items which they thought would measure pupil desire for school accomplishment, willingness to try, and utility for competition.

Reference: Russell, Ivan L. Motivation for School Achievement: Measurement and Validation. Journal of Educational Research 62: 263-266; February 1969.

Title: *A Test of Understandings of Selected Properties of a Number System in Iloco for Grades 4, 5, and 6*

Developed by: F. P. Santos

Content: measures mathematical understanding of Filipino children who speak Iloco

Format: 40 items

Sample: Revised after two trial tests: 63-item Survey Test administered to 348 fourth-grade and 150 sixth-grade pupils; 55-item Tentative Form given to 297 fourth-grade and 336 sixth-grade pupils. Final Form administered to 830 pupils--239 in grade 4, 308 in grade 5, 283 in grade 6 (all in Philippines).

Reliability: r = .70 (grade 4), .40 (grade 5), .67 (grade 6), .64 (total sample)

Correlations: not specified in abstract

Validity: Related literature reviewed. Panel of experts asked to judge the extent to which each item on the Tentative Form corresponded to a mathematical concept it purported to measure. Collective judgment, criticisms, and suggestions of panel used to choose and revise items for Final Form.

Reference: Santos, Felix P. A Test of Understandings of Selected Properties of a Number System in Iloco for Grades 4, 5, and 6. (Indiana University, 1968.) *Dissertation Abstracts* 29A: 3506; April 1969. [Order No. 69-6770]

Title: *A Test of Understanding Our Number System and Its Basic Operations*

Developed by: G. W. Schlinsog

Content: measures child's understanding of the decimal system: cardinal and ordinal number, place value, structure of the decimal system, different names for a number, process of regrouping, addition, subtraction, multiplication, and division

Format: 50 questions

Sample: 12 sixth-grade classes (302 pupils)

Reliability: r = .98 (Pearson product-moment split halves), r = .99 (addjusted by Spearman-Brown formula). Short form of 32 items, r = .83 (split halves), r = .91 (adjusted by Spearman-Brown formula).

Correlations: not specified in article or abstract

Validity: ten processes or concepts identified as being involved in child's understanding of the decimal system

References: Schlinsog, George W. The Effects of Supplementing Sixth-Grade Instruction with a Study of Non-Decimal Numbers. *Arithmetic Teacher* 15: 254-263; March 1968.

Schlinsog, George William. The Effects of Supplementing Sixth Grade Arithmetic Instruction with a Study of Other Number Bases. (University of Oregon, 1965.) *Dissertation Abstracts* 26: 5307; March 1966. [Order No. 66-629]

Title:	Schwartz Early Mathematics Inventory
Developed by:	A. N. Schwartz
Content:	assesses mathematical achievement of children ages 3 through 5
Format:	81 items on 64 pages, in 14 categories. Paper-and-pencil instrument, items read by test administrator. Administered to groups of 6 to 12 children; three sittings; day 1, 12-25 minutes; day 2, 10-18 minutes; day 3, 12-28 minutes. Pre-inventory exercises to familiarize children with procedures. (Test described specifically in article.)
Sample:	215 kindergarten children (ages 5-0 to 6-5)
Reliability:	r = .94 (Kuder-Richardson formula 20). Item difficulty ranged from .12 to .85. Point-biserial correlations ranged from .11 to .62; 49 items above .40. Interitem correlations ranged from -.16 to .82. Ten factors; 84 per cent of items had highest loading on unrotated first factor (accounted for 52 per cent of variance).
Correlations:	not specified in article
Validity:	Three primary sources used to develop concepts and the initial item pool: (1) literature survey regarding individual or group testing; (2) individual assessments of 268 kindergarten children; and (2) kindergarten teachers interviewed in respect to their number experiences with children.
References:	Schwartz, Anthony N. Assessment of Mathematical Concepts of Five-Year-Old Children. Journal of Experimental Education 37: 67-74; Spring 1969. Findley, Warren G. and Others. Postdoctoral Research Training Program in Educational Stimulation, Final Report. Athens, Georgia: Research and Development Center in Educational Stimulation, University of Georgia, 1969. ED 035 455. 40 pages.

Title: "Tests for COLAMDA Objectives"

Developed by: F. J. Schwartz

Content: assesses attainment of objectives of mathematics materials for low achievers

Format: not specified in abstract

Sample: 18 classes in grades 7 and 8 in six schools

Reliability: "Reliability and validity were identified and established for the evaluative instruments."

Correlations: not specified in abstract

Validity: "developed from behavioral objectives which were written for the educational objectives of the COLAMDA material"

Reference: Schwartz, Frederick J. The Impact on Learning of COLAMDA Project Materials on Low Achievers in Mathematics. (University of Denver, 1971.) Dissertation Abstracts International 32A: 3576; January 1972. [Order No. 72-2234]

Title: "A Modern Mathematics Test to Evaluate Pre-Set Goals"

Developed by: D. M. Scott

Content: measures the degree to which teachers' aims (in a selected set of classrooms) were achieved.(rather than the general goals commonly measured by standardized tests)

Format: not specified in abstract

Sample: 375 pupils in 11 classes from grades 4-8 in one school

Reliability: "ranged from acceptable to good" (Kuder-Richardson formula 21)

Correlations: Scores correlated with Iowa Test of Basic Skills Arithmetic scores "to determine the degree of relationship between two divergent tests"; these scores were correlated with teachers' ratings of students (Pearson Product-Moment Coefficient). Correlations were significant at .05 and .01 levels, except the grade 7 correlation between the experimental test and teacher ratings, significant only at .05 level.

Validity: Based on mathematics objectives of teachers, obtained through structured interviews with each teacher. After administration of the test, teachers evaluation of each pupil on rating sheets made from the same objectives used in developing the test were secured. (See "Correlations".)

Reference: Scott, Dorothy Marie. A Modern Mathematics Test to Evaluate Pre-Set Goals in a City School. (St. Louis University, 1970.) Dissertation Abstracts International 31A: 3791; February 1971. [Order No. 71-3289]

Title: "Test on Selected Geometric Concepts"

Developed by: S. A. Shah

Content: assesses achievement in geometric concepts related to recognition of plane figures, nets, symmetry, reflection, rotation, translation, bending and stretching, and networks

Format: 9 sections, administered in three sittings, 117-160 minutes (test illustrated in article)

Sample: 374 pupils, ages 7-11

Reliability: r = .93 (Kuder-Richardson formula 21)

Correlations: not specified in article

Validity: "considered test to be valid, for it represented some of the basic mathematical ideas related to the topics taught"

Reference: Shah, Sair Ali. Selected Geometric Concepts Taught to Children Ages Seven to Eleven. Arithmetic Teacher 16: 119-128; February 1969.

Title: "Mathematics Achievement Tests"

Developed by: M. S. Shakrani

Content: assesses mathematical achievement of pre-service teachers on measurement, numeration systems, sets and set relations, whole numbers, fractions, decimals, relations and functions, probability and statistics, and mathematical systems

Format: two parallel forms for each topic

Sample: 38 freshman elementary education majors

Reliability: r = .77 to .93

Correlations: Significant correlations were found between pre- and posttest scores but not with the Test of Basic Mathematical Understandings or two attitude measures.

Validity: criterion-referenced

Reference: Shakrani, Mosen Sharif. A Formative Evaluation of the Mathematics Component of an Experimental Elementary Teacher Education Program at Michigan State University. (Michigan State University, 1973.) Dissertation Abstracts International 34A: 3223; December 1973. [Order No. 73-29,780]

Title: *"Attitude Toward Mathematics Inventory"*

Developed by: S. D. Shatkin

Content: assesses attitude toward mathematics

Format: Likert-type instrument

Sample: prospective elementary school teachers in a mathematics course

Reliability: r = .97 (internal consistency); r = .98 (split-halves)

Correlations: prediction of success in the mathematics course "effectively accomplished" using the factors of the American College Test (ACT) Mathematics score, cumulative grade point average, and a preliminary attitude test score

Validity: "Discussion of internal factors, face validity, construct validity, and relation to certain external criteria, led to the conclusion that this was also a highly valid instrument."

Reference: Shatkin, Stephen David. A Study of the Change of Attitudes Toward Mathematics of Prospective Elementary School Teachers. (The Ohio State University, 1968.) *Dissertation Abstracts* 29A: 2904; March 1969. [Order No. 69-4969]

Title: "Test on Algebraic Problems"

Developed by: T. J. Sheehan

Content: assesses algebraic problem-solving achievement

Format: 71 items (27 higher mental-process and 44 lower mental-process items)

Sample: 107 students in grade 9

Reliability: r = .83, total test (Kuder-Richardson formula 20); r = .70, high-process subtest; r = .74, low-process subtest

Correlations: not specified in article

Validity: Large pool of algebra items submitted to two experts in mathematics for appraisal; only those items which both judges agreed were valid with respect to content and construct were included in the final version of the test.

References: Sheehan, T. Joseph. Patterns of Sex Differences in Learning Mathematical Problem-Solving. Journal of Experimental Education 36: 84-87; Summer 1968.

Sheehan, T. J. The Relationship Between Student's Degree of Freedom and Success in Higher Mental Process Learning. Unpublished doctoral dissertation, University of Chicago, 1965.

Title: *"Test for Probability and Statistics Unit Objectives"*

Developed by: J. L. Shepler

Content: assesses knowledge of 14 objectives related to probability and statistics

Format: 72 items (36 one-dimensional sample space problems, 19 two-dimensional, 7 one- and two-dimensional, 10 involving ordering of two fractions); criterion-referenced

Sample: 25 pupils in one sixth-grade class

Reliability: pretest, r = .86; posttest, r = .65 (Hoyt's internal consistency coefficient)

Correlations: not specified in article or abstract

Validity: Task analysis of content developed. "Test had content validity since items were criterion items based on instructional analysis and materials ... written to test specific behavioral objectives ...".

References: Shepler, Jack Lee. Parts of a Systems Approach to the Development of a Unit in Probability and Statistics for the Elementary School. *Journal for Research in Mathematics Education* 1: 197-205; November 1970.

Shepler, Jack Lee. A Study of Parts of the Development of a Unit in Probability and Statistics for the Elementary School. (The University of Wisconsin, 1969.) *Dissertation Abstracts International* 31A: 1151-1152; September 1970. [Order No. 70-3702]

Shepler, J. L. A Study of Parts of the Development of a Unit in Probability and Statistics for the Elementary School. Technical Report No. 105. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1969. ERIC: ED 038 302, 303, 304, 305. 146 pages, 153 pages, 98 pages, 60 pages.

Romberg, Thomas A. and Shepler, Jack. Retention of Probability Concepts: A Pilot Study into the Effects of Mastery Learning with Sixth-Grade Students. *Journal for Research in Mathematics Education* 4: 26-32; January 1973.

Title: "Test on Word Problems"

Developed by: J. M. Sherrill

Content: word problems, selected from Y- and Z-population NLSMA test batteries, presented with or without pictorial representations

Format: 20 problems: Form A, prose description of the problem situation, with five distractors for each; Form B also included accurate pictorial representation for each item; Form C included distorted pictorial representation for each item

Sample: Preliminary form, 40 problems selected from NLSMA test batteries; best-discriminating items selected. Final form administered to 322 tenth-grade students.

Reliability: r = .40 (Form A), .70 (Form B), .53 (Form C) (Cronbach's alpha)

Correlations: not specified in abstract or article

Validity: problems from NLSMA test batteries

References: Sherrill, James M. The Effects of Different Presentations of Mathematical Word Problems Upon the Achievement of Tenth Grade Students. School Science and Mathematics 73: 277-282; April 1973.

Sherrill, James Malcolm. The Effects of Differing Presentations of Mathematical Word Problems Upon the Achievement of Tenth Grade Students. (The University of Texas at Austin, 1970.) Dissertation Abstracts International 31A: 3427; January 1971. [Order No. 71-191]

Title: *Short Knowledge of Educational Research Test*

Developed by: B. G. Short

Content: assesses teachers' knowledge of educational research

Form: 40 items

Sample: 204 secondary school teachers (including mathematics)

Reliability: not specified in abstract

Correlations: relationships examined with scores on a semantic differential of attitudes toward educational research and demographic variables

Validity: content basis established by extracting common research elements from representative textbooks on measurement, statistics and research, which were then judged by a panel of educational researchers

Reference: Short, Byrl G. A Study of Secondary School Teachers' Knowledge of and Attitudes Toward Educational Research. (The Pennsylvania State University, 1971.) *Dissertation Abstracts International* 33A: 87; July 1972.

Title: *Definitions: Operations*; *Generalizations: Operations*; and *Operations: Properties*

Developed by: R. J. Shumway

Content: Definitions: Operations measures student's ability to read definitions of random operation. Generalizations: Operations measures student's tendency to overgeneralize the properties of operations. Operations: Properties measures student's tendency to overgeneralize the properties of operations to the basic operations of arithmetic.

Format: not specified in abstract or article

Sample: 84 eighth-grade students in four classes

Reliability: by class: Definitions: Operations, .95, .93, .92, .95; Generalizations: Operations, .82, .70, .85, .84; Operations: Properties, .69, .46, .70, .69 (Kuder-Richardson formula 20)

Correlations: not specified in abstract or article

Validity: not specified in abstract or article

References: Shumway, Richard James. The Role of Counterexamples in the Development of Mathematical Concepts of Eighth Grade Mathematics Students. (University of MInnesota, 1969.) *Dissertation Abstracts International* 30A: 3368-3369; February 1970. [Order No. 70-1817]

Shumway, Richard J. Negative Instances and Mathematical Concept Formation: A Preliminary Study. *Journal for Research in Mathematics Education* 2: 218-227; May 1971.

Title:	"Instrument to Record Teacher-Pupil Interaction"
Developed by:	G. W. Smith
Content:	records simultaneously teacher and pupil behavior in the classroom environment
Format:	observer records the major activity of the teacher and pupil simultaneously, in one-minute segments
Sample:	First trial with 60 pupils in grades 2, 3, and 4 (3088 five-minute segments). Second trial, 24 pupils in grade 4 (434 observations).
Reliability:	inter-observer agreement of the various categories, .73 to .96
Correlations:	relation of behavior and achievement examined -
Validity:	not specified in abstract
Reference:	Smith, George Wilson. The Development of an Instrument to Record the Interaction Between Teacher and Pupil in the Classroom and the Correlation of Certain Factors with Achievement. (University of Maryland, 1971.) Dissertation Abstracts International 32A: 1991-1992; October 1971. [Order No. 71-25.260]

Title:	*Place-Value Mastery Test*; *Place-Value Diagnostic Tests*
Developed by:	R. F. Smith
Content:	Mastery Test assesses mastery of place-value tasks involving hundreds, tens, and ones. Five Diagnostic Tests identify subordinate skills considered prerequisite to successful performance on tasks contained in Mastery Test (sample items included in article).
Format:	completion items
Sample:	323 pupils in grade 2 in four schools
Reliability:	Pilot study, r = .53 to .93; items which discriminated poorly eliminated. Five difficult skills noted in article.
Correlations:	not specified in abstract
Validity:	Task analysis used to identify prerequisite skills. The skills and all tests were validated by specialists in elementary school mathematics.
References:	Smith, Robert Francis. A Diagnostic Study of Pupil Performance on a test of Skills Relevant to the Mastery of Place-Value Tasks. (Fordham University, 1972.) *Dissertation Abstracts International* 33A: 87-88; July 1972. [Order No. 72-20,597] Smith, Robert F. Diagnosis of Pupil Performance on Place-Value Tasks. *Arithmetic Teacher* 20: 403-408; May 1973.

Title: "Discovery Test on Number Series"

Developed by: L. Sowder

Content: assesses ability to discovery generalizations about number series

Format: 8 items (from pool of items which were pretested); individually administered

Sample: 272 pupils in grades 4-7

Reliability: r = .56 (grade 4), .60 (grade 5), .75 (grade 6), .74 (grade 7), .75 (all grades) (Hoyt reliability coefficient). Had there been 20 items, r = .76, .79, .88, .88, .88 (Spearman-Brown formula).

Correlations: not specified in reports

Validity: not specified in reports

Reference: Sowder, Larry. Discovery Learning: A Status Study, Grades 4-7, and an Examination of the Influence of Verbalizing Mode on Retention. Technical Report No. 99. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1969. ERIC: ED 035 593. 154 pages.

Sowder, Larry. Performance on Some Discovery Tasks, Grades 4-7. Journal for Research in Mathematics Education 2: 5-11; January 1971.

Title: "*Attitudes Toward Mathematics Inventory*"

Developed by: W. R. Spickerman

Content: assesses attitude toward mathematics

Format: Likert-type instrument

Sample: 713 pupils in grades 8-12

Reliability: not specified in abstract (split-halves, Spearman-Brown formula for each grade and total school)

Correlations: Relationships between attitudes toward mathematics and sex, mathematics course enrollement, mathematics teacher, mathematics mark aspiration, and socio-economic class determined for all five grades. Relationships between attitudes toward mathematics and intelligence test scores, achievement test scores, and course marks determined for grade 9.

Validity: evaluated in terms of three coefficients of prediction and a validity coefficient

Reference: Spickerman, William R. A Study of the Relationships Between Attitudes Toward Mathematics and Some Selected Pupil Characteristics in a Kentucky High School. (University of Kentucky, 1965.) *Dissertation Abstracts International* 30A: 2733; January 1970. [Order No. 70-311]

Title: "Test on Conservation of Numerousness",
"Test on Addition Problems", and
"Addition Facts Test"

Developed by: L. P. Steffe

Content: assesses conservation of numerousness, problem-solving ability, and knowledge of addition facts

Format: Conservation test, 12 items, each a comparison of two sets. Addition problems test, 18 items, half involving transformation; six problems with accompanying physical aids, six with pictorial aids, six with no aids. Facts test, 10 items.

Sample: 341 pupils in grade 1 (132 pupils in most analyses)

Reliability: Conservation test, r = .69. Total problems test, r = .83; problems with physical aids, r = .64; problems with pictorial aids, r = .69; problems with no aids, r = .65; problems with transformations, r = .65; problems with no transformations, r = .81 (internal consistency).

Correlations: Between scores on number facts test and problems without aids, .46; with aids, .41; with total problem-solving test, .49.

Validity: generally discussed, but not specified

References: Steffe, Leslie Philip. The Performance of First Grade Children in Four Levels of Conservation of Numerousness and Three I. Q. Groups When Solving Arithmetic Addition Problems. (The University of Wisconsin, 1966.) *Dissertation Abstracts* 28A: 885-886; August 1967. [Order No. 66-13,840]

Steffe, Leslie P. The Performance of First Grade Children in Four Levels of Conservation of Numerousness and Three IQ Groups When Solving Arithmetic Addition Problems. Technical Report No. 14. Madison: Research and Development Center for Learning and Re-education, 1966. ED 016 535. 67 pages.

Steffe, Leslie P. The Relationship of Conservation of Numerousness to Problem-Solving Abilities of First-Grade Children. *Arithmetic Teacher* 15: 47-52; January 1968.

Title: *Quantitative Comparisons Test* and *Problem Solving Test*

Developed by: L. P. Steffe and E. H. Harper

Content: assesses conservation of numerousness and problem-solving ability

Format: Comparisons test, 15 items. Problem-solving test, 48 items.

Sample: pupils in kindergarten, grade 1

Reliability: Comparisons test, reported in reference (1), r = .87 (kindergarten), .75 (grade 1); reported in reference (2), r = .86 (Kuder-Richardson formula 20). Problem-solving test, reported in reference (2), r = .59 to .69 (Kuder-Richardson formula 20).

Correlations: intercorrelations between items given in references

Validity: modified versions of "Test on Conservation of Numerousness" and "Test on Addition Problems" developed by Steffe

References: Harper, E. Harold and Steffe, Leslie P. The Effects of Selected Experiences on the Ability of Kindergarten Children to Conserve Numerousness. Technical Report No. 38. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1968. ED 021 752. 52 pages.

Steffe, Leslie P. and Johnson, David C. Problem-Solving Performances of First-Grade Children. *Journal for Research in Mathematics Education* 2: 50-64; January 1971.

For another version of the problem-solving test, see: Steffe, Leslie P. The Effects of Two Variables on the Problem-Solving Abilities of First-Grade Children. Technical Report No. 21. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1967. ED 019 113. 23 pages.

Title: "Tests on Ratio and Fraction Concepts"

Developed by: L. P. Steffe and R. B. Parr

Content: measures performance on "problems which may be classified as ratios or fractions"

Format: 6 tests--4 pictorial, 2 symbolic; 8 items each

Sample: 360 pupils in grades 4-6 in two school systems

Reliability: r = .83 to .93 for the "missing numerator-pictorial" test; r = .72 to .91 for the "missing denominator-pictorial" test; data for the ratio and fraction subtests of each also given. Intercorrelations of tests specified by school

Correlations: see "Reliability"

Validity: not specified in reference

Reference: Steffe, Leslie P. and Parr, Robert B. The Development of the Concepts of Ratio and Fraction in the Fourth, Fifth, and Sixth Years of the Elementary School. Technical Report No. 49. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1968. ED 023 612. 52 pages.

Title: *Time Concept Test*

Developed by: L. E. Stephens

Content: measures attainment of concepts related to telling time

Format: individually administered; child is to draw clock, answer questions relating to times, tell time shown on clock faces; 3 to 10 minutes administration time

Sample: 160 kindergarten pupils

Reliability: r = .88 (Kuder-Richardson formula 21). Discrimination "adequate"; difficulty index ranged from 2 to 79, with many items clustered at the more difficult levels.

Correlations: not specified in abstract or article

Validity: Based on interview questions developed by previous researchers and preliminary work done by Springer in 1950. Validity based on "rational validity, all items being related to the telling of time". Submitted to panel of primary teachers to determine appropriateness of content and statement of items.

References: Stephens, Lois Evans. What Concepts of Telling Time Can Be Developed by Kindergarten Children. (University of California, Los Angeles, 1964.) *Dissertation Abstracts* 25: 1793-1794; September 1964. [Order No. 64-8338]

Stephens, Lois and Dutton, Wilbur H. The Development of Time Concepts by Kindergarten Children. *School Science and Mathematics* 69: 59-63; January 1969.

Title: "Diagnostic Tests in Mathematics: Grade 7"

Developed by: R. L. Stevenson and team of teachers

Content: assesses achievement on each of ten mathematics units

Format: diagnostic, 10 tests

Sample: 142 seventh-grade students

Reliability: $r > .89$

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Stevenson, Robert Louis. The Achievement Gains in Mathematics of Seventh Grade Pupils When Achievement Grouping and Flexible Scheduling Are Employed in a Team Teaching Program. (New York University, 1966.) Dissertation Abstracts 27A: 3785-3786; May 1967. [Order No. 67-4911]

Title:	"Test on Knowledge of Mathematics"
Developed by:	L. B. Strain
Content:	assesses prospective elementary-school teachers' knowledge of mathematics content
Format:	objective test
Sample:	945 prospective teachers in four colleges
Reliability:	Form A, r = .58; Form B, r = .50 (Pearson Product-Moment correlation, Spearman-Brown formula); "deemed satisfactory"
Correlations:	not specified in abstract
Validity:	"Devised on basis of the content of the selected subjects as treated in elementary-school curriculum materials." "Test relevance was determined by care taken in selection of item content, method of test construction, and advice by specialists in pertinent fields."
Reference:	Strain, Lucille Brewton. Prospective Elementary-School Teachers' Knowledge of Selected Subject Matter. (The Ohio State University, 1965.) *Dissertation Abstracts* 26: 1502-1503; September 1965. [Order No. 65-9384]

Title: "Rank Order Survey Instrument: Mathematics"

Developed by: R. H. Strand

Content: assesses attitude toward goals of mathematics education and toward state textbooks

Format: 24 different positive statements representing functional definition of the four goals under six different headings

Sample: 278 in-service elementary teachers and 26 college professors

Reliability: not specified in abstract

Correlations: not specified in abstract

Validity: Based on definitions of goals from study of literature of mathematics education. "Validated by the numerous tests to which it was subjected. A readily interpretable aspect of the validation was the preference/perception contrast by differences or correlated proportions..."

Reference: Strand, Richard Henry. Attitudes of Teachers and College Professors Toward Goals and the Elementary Mathematics Program in California. (University of Southern California, 1973.) *Dissertation Abstracts International* 33A: 4813; March 1973. [Order No. 73-7269]

Title:	Instrument for Evaluating Experimental Research Reports
Developed by:	M. N. Suydam
Content:	used to evaluate reports of experimental educational research--applied to reports of research in mathematics education
Format:	9 questions to be assigned rating of 1-5; "key points" for each aid in decision-making. (Instrument included in article.)
Sample:	First study, 10 randomly selected reports of research in elementary school mathematics, rated by 3 judges. Second study, 10 reports (stratified random selection) rated by 12 judges from two fields at two levels.
Reliability:	First study: interrater agreement was .91 (AOV internal consistency); individual ratings, r = .77 (Snedcor's formula for intraclass reliability). Second study: interrater reliability was .94; individual ratings, r = .57.
Correlations:	no correlations with other instruments obtained
Validity:	Lists of suggestions for evaluating educational research proposed by 24 writers in the field were compiled; the nine points found to be consistently repeated form the basis for the instrument.
References:	Suydam, Marilyn Nancy. An Evaluation of Journal-Published Research Reports on Elementary School Mathematics, 1900-1965. (Volumes I and II). (The Pennsylvania State University, 1967.) Dissertation Abstracts 28A: 3387-3388; March 1968. Suydam, Marilyn N. An Instrument for Evaluating Experimental Educational Research Reports. Journal of Educational Research 61: 200-203; January 1968.

Title: Attitude Toward Mathematics Scale (Form B)

Developed by: M. N. Suydam and C. R. Trueblood

Content: assesses attitude toward mathematics

Format: 26 items, Likert scale (a version has been developed in which primary-grade pupils answer by circling a picture)

Sample: Form A was administered to groups of pre- and in-service elementary teachers and to pupils in elementary schools (total n approximately 3000); Form B is a revised version which differs from Form A only in the wording of several items, to make the vocabulary more appropriate for elementary school pupils. In the study cited below, it was administered to 470 pupils in grade 9 in CAI and non-CAI algebra and general mathematics courses.

Reliability: r = .95 (n = 3000); in study cited below, r = .88 to .96 (internal consistency)

Correlations: Significant correlations between attitude and achievement were found in three of four CAI groups. Some data indicated a correlation of attitude scores with attendance.

Validity: Certain items from other scales (e.g., Dutton and Aiken-Dreger) were combined with items developed by the authors and other mathematics education faculty. The items in this pool were submitted to seven judges for sorting on an 11-point scale ranging from "not important" to "vital". One the basis of data from this analysis, a preliminary version of the scale was developed and administered to groups of pre-service teachers; following item analysis, it was revised again.

Reference: Mitzel, Harold E.; Hall, Keith A.; Suydam, Marilyn N.; Jansson, Lars C.; and Igo, Robert V. A Commonwealth Consortium to Develop, Implement and Evaluate a Pilot Program of Computer-Assisted Instruction for Urban High Schools, Final Report. University Park, Pennsylvania: The Pennsylvania State University, 1971. ED 059 604. 232 pages.

Title: "Criterion Test on Geometric Concepts"

Developed by: W. F. Szetela

Content: measures achievement on concepts of network, vertex, region, and arc

Format: 14 items

Sample: 192 students in grade 8

Reliability: r = .77 (Kuder-Richardson formula 21)

Correlations: not specified in article or abstract

Validity: not specified in article or abstract

References: Szetela, Walter Frank. The Effects of Test Anxiety and Success-Failue on Mathematics Performance in Grade Eight. (University of Georgia, 1970.) Dissertation Abstracts International 31A: 5949; May 1971. [Order No. 71-13,135]

Szetela, Walter. The Effects of Test Anxiety and Success/Failure on Mathematics Performance in Grade Eight. Journal for Research in Mathematics Education 4: 152-160; May 1973.

Title: "Test on Real Number System Unit"

Developed by: J. D. Taylor

Content: measures achievement on fourteen topics in a unit on the real number system

Format: not specified in abstract

Sample: 17 students in an analytic geometry class

Reliability: not specified in abstract

Correlations: not specified in abstract

Validity: Test and unit "presented to a panel of mathematicians and mathematics educators. Each panelist was asked to attest to the validity of the test..."

Reference: Taylor, Jerry Duncan. An Experimental Approach to the Development of the Real Number System Through Cauchy Sequences. (The Florida State University, 1969.) Dissertation Abstracts International 30B: 5602-5603; June 1970.

Title: *Area-Concept Attitude Inventory* and *"Mathematics Achievement Test"*

Developed by: A. L. Temple, Jr.

Content: assesses mathematical attitude and achievement of pre-service elementary teachers

Format: Attitude Inventory, 10-scale semantic differential; achievement test, 50 multiple-choice items

Sample: 93 pre-service elementary teachers

Reliability: achievement test, r = .84 (Cronbach's alpha)

Correlations: The Aiken-Dreger and Dutton scales were significant predictors of achievement; the Attitude Inventory Area and Concept scores were not good predictors of achievement. The four attitude measures were found to be significantly interrelated.

Validity: see "Correlations"

Reference: Temple, Austin Limiel, Jr. The Effectiveness of Semantic Differential Forms in Measuring Attitudes of Prospective Elementary School Teachers. (George Peabody College for Teachers, 1971.) *Dissertation Abstracts International* 32B: 4091-4092; January 1972. [Order No. 72-3838]

Title: "Test on Modern Mathematics in the Primary Grades"

Developed by: J. W. Thompson, Jr.

Content: measures achievement in "modern" mathematics in primary grades

Format: 100 items

Sample: Pilot test of 342 items administered to 221 pupils from two classes of each of the first four grades. Item analysis used to choose 25 items from each of the four grade levels for inclusion on the final test. Final test administered to 403 pupils in four classes of each of the first four grades (16 classes).

Reliability: r = .99 (split-half, Spearman-Brown prophecy formula); "half-test method" also indicated reliability. Item difficulty and discrimination determined.

Correlations: see "Validity"

Validity: Major objectives of primary grade "modern" mathematics instruction derived from analysis of current courses of study, textbooks, and reports of recognized study groups. Test items based on these objectives were evaluated by five college professors considered authorities on "modern" mathematics. Pilot test found to be valid and reliable. To insure content validity, a careful check was made to see that all of the objectives were measured on the final form. Statistical validity demonstrated by positive correlation between the test and CTMM scores at each grade level. Statistical validity further demonstrated by showing the mean score significantly increased with grade level.

Reference: Thompson, John William, Jr. A Measurement of Achievement in Modern Mathematics in the Primary Grades. (North Texas State University, 1968.) *Dissertation Abstracts* 29B: 3839; April 1969. [Order No. 69-5281]

Title:	Exponential Non-Decimal Base Achievement Test
Developed by:	C. R. Trueblood
Content:	measures understanding of selected concepts in exponential notation and non-decimal bases
Format:	70 items; three parts: Part I, multiple-choice items; Part II, requires pupil to construct or complete a diagram; Part III, multiple-choice items
Sample:	Pilot study, 112 pupils in four fifth-grade classes; revised after item analysis. Final form administered to seven fourth-grade classes.
Reliability:	Posttest, r = .95; retention test, r = .95 (Kuder-Richardson formula 20). Mean item difficulty, .63, .60; mean item-total-score correlation, .62, .62. Correlations between parts, .82, .74, .67 (AOV reliability).
Correlations:	not specified in dissertation
Validity:	items submitted to three judges knowledgeable in the field of elementary school mathematics; judges agreed on content validity
Reference:	Trueblood, Cecil Ross. A Comparison of Two Techniques for Using Visual-Tactual Devices to Teach Exponents and Non-Decimal Bases in Elementary School Mathematics. (The Pennsylvania State University, 1967.) Dissertation Abstracts 29A: 190-191: July 1968. [Order No. 68-8755]

Title: *A Test of Arithmetic Understanding*

Developed by: R. Von Brock

Content: assesses understanding of computational skills, skills involving the use of numbers and number systems, and skills involving the use of figures and graphs, of pupils in grades 4-6

Format: 55 multiple-choice and free-response items; seven scores, one for each of three subject areas and one for each of four cognitive objectives (Bloom's Taxonomy) (Test included in article.)

Sample: 147 fifth-graders in six classes

Reliability: r = .86 (split-half correlation coefficient corrected by Spearman-Brown formula)

Correlations: not specified in article

Validity: Items evaluated by a fifth-grade teacher. Pilot study results tended to support the face validity of the instrument (pupils scored higher on computation than on numbers, higher on numbers than on figures and graphs; scores decreased from knowledge through analysis levels).

Reference: Von Brock, Robert. Measuring Arithmetic Objectives. *Arithmetic Teacher* 12: 537-542; November 1965.

Title: *A Test of Arithmetic Principles, Elementary Form*

Developed by: R. C. Welch and C. W. Edwards, Jr.

Content: measures the degree to which children in grades 3 through 6 comprehend certain selected principles of the mathematics program

Format: 48 multiple-choice items--place value, 17 items; ordinal concept, 6 items; reading and writing numerals, 5 items; commutative principle, 6 items; associative principle, 5 items; distributive principle, 5 items; identity element, 4 items. Percentile ranks determined. (Test included in reference.)

Sample: 84 items given to small group of third and fourth graders; revised. First form, 67 items, administered to 50 third- and 20 sixth-graders; revised. Second form, 61 items, administered to 50 third- and 37 sixth-graders; revised. Third form, 49 items, administered to 170 pupils in grades 3-6. Fourth form revised after suggestions of panel of experts. Final form administered to 1500 pupils in grades 3-6.

Reliability: r = .88; grade 3, .75; grade 4, .72; grade 5, .76; grade 6, .77 (Froelich formula). Discriminates between children of greater and lesser understanding at each grade level. Difficulty indices, .22 to .84.

Correlations: not specified in article

Validity: Model items secured from other studies. Panel of 12 authorities in the field of arithmetic instruction indicated that validity was good to high.

Reference: Welch, Ronald C. and Edwards, Charles W., Jr. A Test of Arithmetic Principles, Elementary Form. *Indiana University School of Education Bulletin* 41: 1-86; September 1965.

Title:	"College Placement Test for Calculus: MATH"
Developed by:	A. S. W. West
Content:	five content areas in algebra and trigonometry "considered to be of importance in predicting survival in three quarters of calculus"
Format:	Written version, 25 items. Computer-administered version (remote teletype), five versions of each of the 25 items, to be selected at random; diagnostic; instant scoring and reporting of results.
Sample:	After item analysis, administered in written form to 580 students in grade 12 in four schools, in one junior college, and in one college. Computer version administered in two high schools.
Reliability:	Written form, r = .93 (test-retest reliability with 94 students). Computer version "shown to be equivalent" (chi square coefficient of correlation).
Correlations:	see "Validity"
Validity:	Commercial tests and textbooks consulted; items reviewed by undergradulate mathematics faculty. Correlation with SAT Mathematics scores and grade point averages, .59. Individual subtest scores correlated separately with grade averages in algebra and trigonometry, .40, .41, .54.
Reference:	West, Anita S. Wolfe. Development of a Computer-Administered Diagnostic College Placement Test in Mathematics. (University of Denver, 1969.) Dissertation Abstracts International 30B: 5154-5155; May 1970. [Order No. 70-6689]

Title: "Number Concept Test"

Developed by: G. H. Wheatley, Jr.

Content: measures attainment of conservation of length and number, cardination, one-to-one correspondence, and counting ability

Format: Piagetian-type; suggested as both a placement and a diagnostic instrument

Sample: administered to 38 first-grade pupils at beginning and end of year

Reliability: not specified in abstract

Correlations: relationship with scores on a standardized achievement test "appears high"

Validity: not specified in abstract

Reference: Wheatley, Grayson H., Jr. Conservation, Counting and Cardination as Factors in Mathematics Achievement Among First-Grade Students. (University of Delaware, 1967.) Dissertation Abstracts 29A: 1481-1482; November 1968. [Order No. 68-13,556]

Title: *"Group Film Test on Conservation"*

Developed by: G. H. Wheatley

Content: assesses child's conservation of length, number, mass, discontinuous quantity, and continuous quantity; second form also included area, weight and volume

Format: Test 1, 11 items--tasks presented via film (35-minute color cuper 8mm.); pupils use response booklets; projector turned on and off. Test 2, 21 items, same administration procedures. Items in document.

Sample: Test 1, 148 pupils in grade 1; Test 2, 1127 pupils in 35 classes in grades 2, 4, and 6

Reliability: Test 1, $r > .91$ (Kuder-Richardson formula 20);
Test 2, $r > .90$ (Kuder-Richardson formula 20)

Correlations: Correlation between scores from group-film and individually administered test (n = 30), .86 for Test 1. For Test 2, correlations with achievement: grade 2, r = .12 to .21 (reading); grade 4, r = .17 to .28 (arithmetic concepts, .26; arithmetic problems, .24); grade 6, r = .13 to .26 (arithmetic concepts, .21; arithmetic problems, .20). Index of reproducibility, grade 2, .80 (Guttman scalogram).

Validity: see "Correlations"; based on items administered in paper-and-pencil form (that have validity)

Reference: Wheatley, Grayson H. *The Development of a Group Film Test of Certain Piagetian Conservations*. April 1972. ERIC: ED 064 315. 17 pages.

Title: *"Test on Conceptual Knowledge of Arithmetic"*

Developed by: N. C. Whitman

Content: assesses conceptual knowledge of arithmetic (that knowledge which allows one to give reasons for the various ways of computing)

Format: 50 multiple-choice items (five same items in article)

Sample: 22 elementary school teachers

Reliability: r = .68 (split-half reliability coefficient, Guttman's formula); r = .69 (Kuder-Richardson formula 20)

Correlations: not specified in article

Validity: not specified in article

Reference: Whitman, Nancy C. In-Service Education and the Learning of Conceptual Mathematics. *Arithmetic Teacher* 13: 149-151; February 1966.

Title:	*Preschool-Kindergarten Modern Mathematics Test*
Developed by:	A. H. Williams
Content:	assesses attainment of mathematical concepts, skills, and abilities for number operations, geometry, measurement, functions and graphs, mathematics sentences, logic, sets, and applications and problem solving
Format:	10 subtests, 63 items (description of each item included in article)
Sample:	595 kindergarten entrants
Reliability:	r = .90 (Kuder-Richardson formula 21)
Correlations:	correlated with Quantitative section of SRA-Primary Mental Abilities For Ages 5 to 7, .49
Validity:	content validity determined by textbook analysis and opinions of a jury of experts
Reference:	Williams, Alfred H. Mathematical Concepts, Skills and Abilities of Kindergarten Entrants. *Arithmetic Teacher* 12: 261-268; April 1965. Williams, Alfred H. Mathematical Concepts, Skills, and Abilities of Kindergarten Entrants. (University of Southern California, 1964.) *Dissertation Abstracts* 25: 3333-3334; December 1964. [Order No. 64-13,513]

Title: "*Achievement Test on Transformational Geometry*"

Developed by: H. J. Williford

Content: measures objectives of unit on mathematical concepts of congruence and rigid motion in primary grades

Format: 44 items related to five objectives and 6 multiple-choice items related to sixth objective

Sample: 63 pupils in 6 classes in grades 2 and 3

Reliability: pretest, r = .80 (internal consistency coefficient); posttest, r = .89. Point-biserial coefficients and other item data included in article.

Correlations: not specified in article or abstract

Validity: not specified in article or abstract

References: Williford, Harold J. A Study of Transformational Geometry Instruction in the Primary Grades. *Journal for Research in Mathematics Education* 3: 260-271; November 1972.

Williford, Harold Johnson. A Study of Transformational Geometry Instruction in the Primary Grades. (University of Georgia, 1970.) *Dissertation Abstracts International* 31A: 6462; June 1971. [Order No. 71-13,152]

Title:	"Computerized Diagnostic Test on Fractions"
Developed by:	E. F. Wolff
Content:	ascertains types of errors student makes in arriving at incorrect answer in addition, subtraction, multiplication and division with fractions
Format:	64 questions; administered and scored via computer
Sample:	12 sixth grade pupils achieving at various levels
Reliability:	not specified in abstract
Correlations:	not specified in abstract
Validity:	34 types of "faulty reasoning" identified by research; these patterns applied to particular questions to obtain a set of anticipated answers, which were programmed into the computer, thus enabling wrong answer to be matched with type of "faulty reasoning". Comparison made with individualized diagnostic test administered by teacher; generally in agreement with computerized test. Information from test used to predict student's answer on similar questions; correct prediction, 66.5 per cent.
Reference:	Wolff, Rabert Francis. A Feasibility Study on the Construction of a Diagnostic Test on Proper Fractions to be Administered, Scored and Interpreted by a Computer. (Lehigh University, 1968.) *Dissertation Abstracts* 29A: 3787-3788; May 1969. [Order No. 69-7367]

Title: "*Time Concept Test*"

Developed by: P. L. Ziegenfuss

Content: assesses attainment of time concepts

Format: three parts: seriation, duration, and coordination

Sample: 100 girls aged 3-10 to 8-7

Reliability: r = .98 (Kuder-Richardson formula 20); r = .74 (two-week test-retest reliability); r = .82 (five-month test-retest reliability)

Correlations: not specified in abstract

Validity: not specified in abstract

Reference: Ziegenfuss, Penny Low. Development and Training of Time Concepts in Young Children. (The Pennsylvania State University, 1972.) *Dissertation Abstracts International* 33A: 5420-5421; April 1973. [Order No. 73-7498]

SUPPLEMENTARY LIST OF INSTRUMENTS

The instruments listed in this section are not included elsewhere in this document. In each instance, either no information relating to reliability and validity was provided in the dissertation abstract, or the instrument was not included in the article. That the instrument was investigator-developed was stated or implied, however. Following the list are the complete references for all entries on the list.

Developer	Content/title	Level	Data
Allen, B. A. (1973)	rational numbers	grades 3-6	----
Anastasiow *et al.* (1970)	geometric concepts	kindergarten	correlations cited
Anderson, R. M. (1970)	multiplication and division	grade 5, junior high	----
Anderson, R. C. (1966)	fractions	grade 5	----
Armstrong, J. R. (1969)	knowledge and understanding of mathematics	grade 6	r = .24 to .84
Armstrong, P. W. (1972	probability	grades 5, 6	----
Arnold, W. R. (1969)	mathematics vocabulary	grade 6	----
Austin, G. R. (1966)	problem solving	grade 6	----
Bailey, H. L. (1970)	geometry	elementary pre-service	----
Bargmann, T. J. (1973)	metric system	grades 3-6	----

Developer	Content/title	Level	Data
Barnard, J. A. (1973)	addition and multiplication of integers	elementary pre-service	----
Barnes, O. D. (1971)	multiplication skills	grades 4-8	----
Barrish, B. (1971)	problems	grades 4-6	----
Bartel, E. V. (1966)	Concept Test	grade 4	----
Bass, H. G. (1971)	topological understanding (tasks)	grades K-2	----
Bat-haee, M. A. (1969)	fractions	grade 5	----
Batker, K. E. (1972)	"algorithms"	elementary pre-service	----
Baumann, R. R. (1966)	group properties (interview tasks)	grades 2, 4	----
Baur, G. R. (1971)	(pre-, posttest)	elementary pre-service	----
Bazik, A. M. (1973)	(post, retention test)	elementary pre-service	----
Beal, J. L. (1973)	Beal's Mathematics Competency Test	grades 7-9, 12	----
Beamer, R. H. (1970)	fractions	grade 5	----
Beattie, I. D. (1970)	Beattie Attitude Scale (toward teaching elementary-school mathematics)	elementary pre-service	----
Becklund, L. A. (1969)	study skills	grades 3-5	----
Beckman, M. W. (1969, 1970)	Mathematical Literacy Test	grades 8, 9	----
Beers, G. S. (1968)	reading in mathematics	elementary pre-service	----
Beeson, R. O., Jr. (1970)	remedial/general mathematics	grade 8, secondary pre-service	----

Developer	Content/title	Level	Data
Behr, M. J. (1967)	modulus seven	secondary	----
Biddle, J. C. (1967)	novel geometry problems	grade 10	----
Bidwell, C. J. (1969)	percentage	grade 5	----
Biot, J. J. (1970)	conservation, fractions	ages 6, 7	----
Bisio, R. M. (1971)	fractions	grade 5	----
Bohan, H. J. (1971)	fractions	grade 5	----
Brantley, B. C. (1971)	mathematical and verbal expression	pre-school; ages 9-12	----
Brodlie, J. G. (1966)	"logical multiplication"	elementary	----
Bronder, C. C. (1973)	fractions	elementary	----
Brown, J. L. (1970)	number series (tasks)	grades 10, 11	r = .86
Brown, L. H. (1970)	Algebra Achievement Test, Forms A and B; Proof Test; Transfer Test	grade 9	----
Buethe, L. C. (1966)	physics formulas	secondary	----
Bunch, M. A. (1973)	polynomials	grade 8	----
Bundrick, C. M. (1969)	vectors	secondary	----
Burdick, C. P. (1970)	integers	grades 5-8	----
Burkhart, L. L. (1968)	division	grade 4	----
Burron, D. S. (1972)	tasks at various cognitive levels	grade 6	----
Byrkit, D. R. (1968)	integers	secondary in-service	----

Developer	Content/title	Level	Data
Call & Wiggin (1966)	Word Problem Test (reading in algebra problems)	grade 11	r = .60
Capps & Cox (1969)	attitude toward arithmetic	grades 4, 5	15-item scale in article
Carlow, C. D. (1968)	probability	grade 9	----
Carmody, L. J. (1971)	number bases	grade 6	----
Carroll, C. A. (1971)	conditional reasoning	grade 9	----
Carry, L. R. (1968)	quadratic inequalities	grade 10	----
Case, J. B. (1969)	chemical equillibrium	secondary	----
Casebeer, K. D. (1968)	numeration systems	elementary pre-service	----
Cathcart & Leidtke (1969)	concepts, applications, problems, facts	grades 2, 3	r = .69 (.78, .91, .98)
Cheatham, B. H., Jr. (1970)	selected geometric concepts	grade 7	----
Chew, H. R. (1971)	(pre-, posttest)	elementary	----
Cole, W. L. (1971)	mathematics skills	grade 9	----
Collins, K. M. (1971)	diagnostic/progress	grades 7, 8	----
Cowan, R. E. (1973)	projective geometry; attitudes toward mathematics and towards geometry (semantic differential)	grades 9-12	----
Coxford, A. F. (1966)	addition, subtraction	grade 1	----
Crabtree, J. F., II (1966)	Mathematics Inventory Test; Directed Numbers Achievement Test	kindergarten, grades 1, 2	----

Developer	Content/title	Level	Data
Crist, R. V. (1969)	time-telling	grade 3	----
Curry, R. D. (1971)	clock arithmetic	ages 8-10	----
Czarnec, W. J. (1973)	logic and set theory	grade 12	----
D'Augustine, C. H. (1964)	geometry and point-set topology	grade 6	4 items in article
Davis, P. H. (1972)	negative numbers	grade 6	----
Deer, G. W. (1969)	logic	grade 10	----
Deighan, W. P. (1971)	attitude toward arithmetic (semantic differential)	grades 3, 5, 6, teachers	----
DeLong, D. D. (1973)	computer programming	elementary pre-, in-service	----
DeLucia, S. W. (1973)	decimals	grade 6	----
Denmark, T. (1968)	Euclidean concept of betweenness	grade 1	complete 9 items in article
Dettmers, R. D. (1970)	logic	elementary pre-service	----
Dilley, C. A. (1970)	division speed, power	grade 4	----
Doherty, J. (1966)	probability	grades 4-6	----
Dorminey, R. J. D. (1973)	Achievement Test; Retention Test, on counting principles	grade 8	----
Duncan, R. (1964)	mathematical concepts	grade 7	r = .83
Dunkley, M. E. (1965, 1972)	set and number (counting) activities (individual inventory)	ages 5, 6	some items cited in articles
Dunlap, W. P. (1971)	whole number operations	grade 4	----

Developer	Content/title	Level	Data
Dutton, W. H. (1965, 1966)	Arithmetic Concept Test	elementary pre-service	r = .89
Dyrli, O. E. (1968)	"logical multiplication"	grade 6	----
Earle, R. A. (1971)	vocabulary relationships	grade 7	----
Ekman, L. G. (1967)	addition, subtraction	grade 3	----
Ellis, L. C. (1972)	Screening Test in Whole Numbers	grade 6	----
Erb, C. A. (1972)	Mathematics Teaching Inventory; Attitude Inventory (from NLSMA items)	grade 8, secondary pre-service	----
Feldhake, H. J. (1966)	attitude toward "new" mathematics	grade 7	8-item questionnaire in article
Ferguson, F. F. (1973)	geometric content	elementary pre-service	----
Ferre, A. V. (1972)	map reading, tables and graphs	elementary	----
Fey, J. F. (1969)	teacher-pupil interaction in verbal communication	secondary in-service	----
Fiel, R. L. (1973)	graphs	grade 8	----
Fincher, G. E. (1965)	addition and subtraction with fractions	grade 5	r = .93 (between forms), .95 (internal)
Fischer, P. (1969)	map skills	grade 6	----
Fithian, E. B., Jr. (1972)	methods of teaching mathematics	elementary pre-service	----
Fleckman, B. (1967)	division	grades 5, 6	----

Developer	Content/title	Level	Data
Flournoy, F. (1964a)	properties for whole number computation	grade 7	complete test in article
Flournoy, F. (1964b)	relationships in whole number computation	grades 5, 6	2 items in article
Flynn, J. T. (1969)	Introduction to Vector Geometry Achievement Test	grades 10-12	r = .78, .79
Foster, R. E. (1973)	Problem Solving Abilities Test	grade 8	----
Francies, H. D. (1971)	attitudes toward arithmetic (importance and feelings; semantic differential)	grades 4, 6	----
Frase, L. E. (1971)	(pre-, posttest)	intermediate grades	----
Friebel, A. C. (1965)	Inventory of Measurement Understandings	grade 7	----
Gabor, G. M. (1972)	Abstract Reasoning Test	grades 7, 8	some sample items in article
Gallick, M. C. (1971)	Test on Coordinate Geometry	grades 5, 6, 9	----
Gannon, G. E. (1973)	topology	elementary pre-service	----
Gardiner, W. L. (1966)	logic	grades 4-12, college	----
Gardner, R. P. (1972)	Gardner-Cantrell Diagnostic Survey of Academic Fundamentals, Arithmetic Level II	EMRs in elementary and junior high school	----
Garrison, F. M. S. (1973)	attitudes toward four subject areas	elementary pre-service	----

Developer	Content/title	Level	Data
Gaslin, W. L. (1972)	Transfer-Oriented Posttest; Fractions Retention Test	grade 9	----
Gawronski, J. D. (1971, 1972)	measures of triangles and quadrilaterals	grade 8	----
Gerlach, V. S. (1965)	fractions	grade 5	----
Goldschmid & Bentler (1968)	conservation	kindergarten through grade 2	r = .58 to .96
Golledge, M. R. (1966)	Piagetian-type reasoning	grades 5-9	----
Graening, J. J. (1972)	Mathematics Teaching Inventory: Teacher Perceptions, Student Perceptions	secondary pre-service	----
Grafft, W. D. (1966)	Computation Ability Test; Understanding Principles of Multiplication Test; Test of Advanced Mathematics Materials	grades 4-6	----
Gravel, H. (1968)	relations	grade 6	----
Gray, W. L. (1970)	mathematics and science behaviors	grade 5	----
Greatsinger, C. (1968)	division with fractions	grade 6	r = .89
Green, G. A. (1970)	Criterion Tests, Posttest, Retention Test, Attitude Tests, Transfer Tests	grade 5	----
Greenes, C. E. Z. (1970)	geometric figures (inventory)	ages 5-9	----
Grouws, D. A. (1972)	addition and subtraction sentences	grade 3	----

Developer	Content/title	Level	Data
Guerriero, C. A. (1972)	Team Learning Preference Scale; Criterion Reference Tests	grade 7	----
Hale, W. T. (1965)	logic	grades 8-12	----
Hampton, H. F.(1968)	(posttest)	grade 5	----
Hand, C. R. (1969)	Mathematics Test	grades 4-6	----
Hand, E. F. (1967)	basic ideas of arithmetic	grades 1-6; elementary in-service	----
Harbeck, Sister C.A. (1973)	Format Test (proofs)	grade 10	----
Harder, R. E. (1972)	conservation of length (behavioral interview)	grade 1	----
Harmon, A. T. (1970)	Ratio Test #1	grade 6	----
Harper, E. H. (1964)	Test of Basic Concepts and Symbols in Arithmetic	elementary pre- and in-service	r = .79, .86
Haukebo, G. K. (1967)	A Test of Arithmetic Understanding; A Graphic Attitude Scale; A Mathematical System Test	elementary pre-service	----
Haynes, J. O. (1964)	multiplication	grade 3	----
Hendrickson, A. D. (1970)	attitude toward mathematics (semantic differential)	elementary pre-service	----
Henney, M. A. (1969)	Verbal Problems Test	grade 4	----
Herbst, L. A. (1968)	Map and Graph Understandings Test	grade 5	----
Herceg, J. (1973)	complex numbers	grade 11	----
Herman, M. L. (1973)	number concepts (interview)	kindergarten	----
Hervey, M. A. (1966)	multiplication	grade 2	----

Developer	Content/title	Level	Data
Higgins, J. (1972)	items from test by Edwards, 1962	grade 5	r = .75
Hill, J. (1967)	Pro-Mathematics Attitude Composite, Mathematics Preference Composite	grade 7	intercorrelation, .69
Holtan, B. (1964)	mathematical inequalities	grade 9	r = .82 to .94
Houde, R. A. (1973)	similarity	grade 6	----
Howard, V. G. (1970)	Pass-Fail Achievement Test in Mathematics	elementary EMRs	----
Howell, E. N. (1966)	inference patterns	grades 7-9	----
Howitz, T. A. (1966)	General Mathematics Achievement Test	grade 9	----
Hrabi, J. S. (1968)	Logic Achievement Test	grades 7, 9	----
Hurd, R. W. (1968)	finite mathematical systems	elementary pre-service	----
Hutcheson, J. W. (1973)	algebra	grade 9	----
Ibe, M. D. (1973)	angular measurement	grade 6	----
Ingle, H. T. (1973)	attitude toward computer's expertise	grades 5, 7, 9	----
Isaac, H. L. (1970)	limit concept	grade 12	----
Jackson, A. (1973)	analytical trigonometry (transformations)	grade 11	----
Jackson, R. L. (1966)	numeration systems	grades 5-7	----
James, J. A. C. (1973)	verbal problems	elementary in-service	----

Developer	Content/title	Level	Data
Jenkins, O. L. H. (1968)	measurement	ages 13-17 EMRs	----
Jensen, L. R. (1973)	How Many Questions? (creativity)	grade 6	----
Jones, R. C. (1972)	addition and subtraction	ages 7-11	----
Jordan, R. J. (1971)	square roots	grade 8	----
Josephina, Sister (1964)	spatial ability (individual inventory)	ages 3-5	complete 8 items noted in article
Josephina, Sister (1965)	number concepts (individual inventory)	ages 4, 5	complete 6 questions in article
Jung, H. R. (1973)	Primary Learning Environment Inventory	grade 2	----
Kane, R. B. (1968)	attitudes toward four subjects	elementary pre-service	complete 7 items in article
Karlin, M. W. (1972)	attitudes toward arithmetic and toward factorization game; prime factorization test	grade 5	----
Kavett, P. F. (1969)	Non-Decimal Test	grades 4, 6	----
Keats & Hansen (1972)	proofs	grade 9	r = .38
Kenney, R. A. (1965)	Mathematical Understandings of Teachers	elementary in-service	complete 50 items in article
Kepner, H. S., Jr. (1971)	vectors	grade	----
Kilpatrick, J. (1968)	word problems (interview coding system)	grade 8	----

Developer	Content/title	Level	Data
King, D. T. (1972)	elementary number theory	grade 9	----
Kipps, C. (1968)	concepts in new mathematics	elementary in-service	r = .80
Knaupp, J. E. (1971)	attitudes toward activities used in arithmetic instruction	grade 2	----
Koch, R. R. (1971)	Geometry Survey	grades 3, 4, teachers	----
Kriegsman, H. F. (1964)	concept of dimension	grade 10	----
LeBlanc, J. F. (1968)	conservation, subtraction	grade 1	----
Leffin, W. W. (1969)	probability	grades 4-7	----
Lehew, C. (1968)	Head Start Mathematical Inventory	ages 4, 5	complete 10 items in article
Leitch, V. D. (1973)	achievement in mathematics	elementary pre-service	----
Lenchner, G. (1972)	circular functions	grade 11	----
Leonard, W. A. (1973)	simple continued fractions; attitude	elementary pre-service	----
Levine, G. (1972)	ranking of four subject areas	grades 3, 4, 6, parents	2 scales in article
Lewis, V. C. (1969)	Value-Vector Index (attitude-press organizations)	grade 8	----
Lindgren _et al_. (1964)	Test of Attitudes Toward Activities Involving Problem Solving (Portuguese)	grade 4	r = .65
Lindsay, C. M. (1966)	(pre-, post-, retention test)	elementary in-service	----

Developer	Content/title	Level	Data
Linville, W. J. (1970)	syntax and vocabulary in verbal problems	grade 3	----
Lorenzen, F. J., Jr. (1973)	Test of Mathematical Understanding	grade 3	----
Maertens, N. (1969)	processes, skills, problem-solving ability	grade 3	sample items in article
Maertens & Johnston (1972)	attitudes toward school-related structures; computation, problem-solving	grade 6	2 or 3 items from each in article
Mahaffey, M. L. (1969)	concepts and computation	elementary in-service, grades 3, 5, 7	----
Mainville, W. E., Jr. (1972)	Mathematics Creativity Test, Forms A and B	elementary pre-service	----
Mallory, C. O. (1969)	(posttest)	elementary pre-service	----
Martau, G. E. (1973)	methods concepts	elementary pre- and in-service	----
McAloon, A. (1969)	Logic Final, Logic Retention Test	grades 3-6	----
McClure, C. W. (1972)	diagnostic test	grade 8	----
McFee, E. E. (1968)	metric measures	grade 7	----
McKeen, R. L. (1971)	teaching tasks	elementary pre-service	----
McKnight, B. J. (1965)	volume	grades 1, 2, 4, 6	----
McMillian, J. A. (1973)	place value	grade 7	----
Meadowcroft, B. A. (1965)	Teacher-Designed Achievement Test	grade 7	----
Melson, R. (1965)	"modern" topics	elementary in-service	26 of 33 items in article

Developer	Content/title	Level	Data
Miller, H. R. (1969)	matrix arithmetic	grades 8, 12	r = .90
Miller *et al.* (1969)	Perspective Ability Test (photographs)	grade 1	r = .91
Miller, L. H. (1965)	computation, understandings	grades 5, 6	----
Milner, S. D. (1973)	concept of variable	grade 5	----
Montgomery, M. E. (1973)	area measurement	grades 2, 3	----
Moody & Wheatley (1969)	numeration system	elementary pre-service	r = .74
Moody *et al.* (1971)	multiplication word problems	grade 3	r = .80
Moray, J. (1968)	Elementary Mathematics Concepts Test	grade 6	----
Morgan, J. H. (1966)	Introduction to Vector Geometry Achievement Test	grade 10	----
Muckey, R. W. (1971)	non-decimal addition and subtraction	grade 2	----
Mullenex, J. L. (1969)	probability	grades 3-6	----
Naramore, V. H. (1969)	field properties	secondary in-service	----
Naylor & Gaudry (1973)	adjustment (semantic differential)	grade 7	----
Needleman, J. R. (1970)	Piagetian area concepts	grades 3-8	----
Neil, M. S. (1969)	word problems	grade 3	----
Neill, R. D. (1966)	Teacher-Made Test; Developed Mathematical Ability Test; Mathematics Achievement Test	grade 7	----
Nelson, L. T. (1969)	functions	grade 8	----

Developer	Content/title	Level	Data
Nelson, N. Z. (1967)	estimation	grades 4, 6	----
Nelson, P. A. (1969)	attitude toward arithmetic	elementary in-service	----
Neuhouser, D. L. (1965)	exponents	grade 8	----
Nibbelink, W. H.	open sentences, computation, algorithms	grade 7	----
Niedermeyer *et al.* (1969)	number series concepts	grade 9	r = .82
Norris, F. R. (1969)	mathematical concepts	grade 6, in-service	----
Nugent, P. T. (1969)	attitudes toward mathematics	elementary in-service	----
O'Brien & Shapiro (1968, 1970)	logic	grades 1-3	several items in article
O'Bryan & Boersma (1972)	conservation of length, area, substance (filmed)	grade 1	r > .85
O'Daffer, P. G. (1969)	mathematical systems	grades 5, 7	----
O'Hare, Sister M. G. (1966)	Size Concept Test	ages 3-6 (Mongoloids)	---
Olsen, G. W. (1969)	concept of slope	grades 5-9	----
Olson, A. T. (1971)	geometry through transformations	grade 10	----
Oner, N. P. (1972)	decimals	grade 6	----
Osborne, A. R. (1967)	subtraction	grades 1, 2	----
Ouellette, H. F. (1973)	problem solving and pattern recognition	elementary pre-service	----
Pace, A. (1968)	conservation of number	kindergarten, grade 1	complete 5-item test in article
Peck, L. K. (1971)	Finite Geometry Test	grades 4, 6, 8	----

Developer	Content/title	Level	Data
Peisach & Wein (1970)	conservation of quantity	kindergarten, grades 1, 2	r = .85. .89, .87
Pickering, M. A. P. (1969)	fractions	elementary	----
Pigge, F. L. (1967)	operations with addition and subtractions with fractions	grades 5, 6	description of items in article
Pond, T. F., Jr. (1973)	attitudes toward individualized instruction	elementary pre-service	----
Post, T. R. (1968)	problem solving	grade 7	----
Prather, F. P. (1971)	Revised Attitude Inventory	secondary pre-service	----
Rathmell, E. C. (1973)	Mastery Test, Concepts Test, Hundreds Test	grade 1	----
Reavis, H. K. (1973)	Basic Math Facts Test	elementary	r = .98
Reeves, C. A. (1972)	mathematical induction	secondary	----
Retzer & Henderson (1967)	logical concepts	grades 7, 8	r = .99, .96
Reynolds, P. R. (1973)	conditional reasoning	grade 10	----
Rice, J. M. (1965)	attitude toward mathematics	elementary in-service	----
Richard, T. H. (1971)	Diophantine equations	elementary pre-service	---
Richer, H. M. (1973)	conservation of substance	grades 1, 2	r = .7
Rickard, E. E. S. (1967)	beginning knowledge (interview)	grade 1	----
Roberge, J. J. (1969a, 1969b, 1970)	Paulus-Roberge Class Reasoning Test and Class and Conditional Reasoning Test	grades 4, 6, 8, 10	----
Robinson, M. L. (1973)	problem solving	grade 6	----

Developer	Content/title	Level	Data
Ropes, G. H. (1973)	problems related to mathematics laboratory activities	grades 2, 6	----
Ross, D. (1970)	Number Knowledge Test	ages 4-10 (MRs)	r = .98, .81
Roy, G. R. (1971)	logic	grade 12	----
Rudisill, E. M., Jr. (1973)	selected teaching strategies	secondary pre- and in-service	----
Ryoti, D. E. (1973)	class and conditional logic	grades 4, 9	----
Sanders, V. A. (1973)	problem solving	grade 4	----
Sanders, W. J. (1972)	statistics	grade 9	----
Scandura, J. (1966)	factoring problems	grade 11	r = .89, .68, .66
Schall, W. E. (1970)	Mental Arithmetic Achievement Test	grade 5	----
Schell, L. J. (1968)	distributive property	grade 3	4 items in article
Schmalz, R. (1972, 1973)	categorizing questions of teachers	elementary pre-service	instrument in article
Schnur & Callahan (1973)	geometric concepts	grade 6	r = .71
Schrankler, W. J. (1967)	Effectiveness Test (multiplication)	grade 4	----
Scott & Rude (1970)	plane geometry via vectors	grade 11	complete 9 items in article
Scrivens, R. V. (1968)	place value, fundamentals, attitude	grade 2	----
Session, D. B. (1971)	rational numbers	grade 2	----
Shaver, M. T. (1969)	basic mathematical concepts	elementary pre-service	----

Developer	Content/title	Level	Data
Shuster & Pigge (1965)	addition, subtraction, basic fractional understandings	grade 5	"highly reliable"
Sipser, K. S. (1966)	geometric-trigonometric topics	grade 10	----
Skipper, S. W. (1973)	Test of Numeration Systems, Forms A and B	elementary pre-service	----
Skvarcius, R. (1972)	Role Perception Scale	grade 9	----
Sloan, J. L. (1970)	decimals	grade 6	----
Smith, G. E. (1973)	teaching division	elementary pre-service	----
Smith, M. A. (1966)	probability, statistics	grade 7	----
Smith, W. D. (1973)	basic function concepts	grade 9	----
Solheim, J. H. (1971)	transformations	grade 10	----
Steffe & Carey (1972)	Conservation of Length Relations Test; Reflexive and Non-reflexive Test; Transitivity of Length Relations Test	ages 4, 5	source of tests noted in article
Stern, A. M. (1971)	(pre-, posttest)	grades 3, 4	----
Stilwell, M. E. (1968)	teacher-pupil interaction during geometric problem solving	grade 10	----
Stochl, J. E. (1964)	Film Test on Teaching Mathematics	elementary pre-service	----
Stommel, L. J. (1967)	Piagetian number concepts	grade 1	----
Swafford, J. O. (1970)	computation, concepts	grade 8	----
Swanson, R. A. (1973)	consumer mathematics	grades 10-12	----
Szetela, W. F., Jr. (1971)	networds	grade 8	----

Developer	Content/title	Level	Data
Tajima, Y. I. (1965)	Number and Clock Time	pre-school	----
Thomas, H. L. (1970)	function	ages 11-14	----
Trafton, P. R. (1971)	subtraction	grade 3	----
Travers, K. J. (1966, 1967)	Test of Choice Behavior in Number Situations (problem solving)	grade 9	----
Tremblay, C. W. (1973)	motion geometry	junior high	----
Troutman, A. P. (1972)	cognitive observation system	--	----
Turek, S. (1973)	Mathematical Systems Test	elementary pre-service	----
Urbach, D. E. (1973)	area measure	grade 5	----
Van Akin, E. F. (1972)	geometric facts and logical reasoning	grade 10	----
Vos, K. E. (1973)	Problem Solving Approach Test; Problem Solving Test	grades 9-11	----
Walek, B. P. (1973)	problem-solving ability	grade 4	----
Ward, W. F. (1973)	functions	grade 12, college	----
Weaver, J. F. (1966)	Inventory, Form G (geometric figures)	elementary	complete 12 items in article
Weaver, J. F. (1971, 1972, 1973a)	addition and subtraction open sentences	grades 1-3	illustrative items in article
Weaver, J. F. (1973b, 1973c)	distributive property for whole number multiplication	grades 4-7	sample item in article; sample test in ERIC ED
Weeks, G. M. (1971)	Test L (on logical reasoning ability)	grades 2, 3	----

Developer	Content/title	Level	Data
Weisman, G. L. (1973)	achievement in activity lessons	elementary pre-service	----
Willcutt, R. E. (1969)	attitude toward mathematics and other subjects	grade 7	20 items in article
Williamson, G. M. (1972)	fractions	grade 6	----
Wills, H., III (1967)	"wide range"	elementary	----
Wilson, J. W. (1965, 1967)	problem solving	grade 4	r = .93 to .98
Winzenread, M. R. (1970)	computation, concepts	grades 7, 8	----
Withnell, M. C. (1968)	mathematical concepts	elementary pre-service	----
Wolff, H. L. (1970)	analysis of computational errors	elementary pre-service	----
Woodall, P. G. (1967)	attitudes toward mathematics	grades 4, 6, 8	----
Worthen, B. R. (1968a, 1968b)	Semantic Differential Attitude Scale; Statement Attitude Scale; Pupil Perception of Teaching Behavior; Concept Knowledge Test; Concept Retention Test; Concept Transfer Test; Negative Concept Transfer Test	grades 5, 6	r ranges from .44 to .92
Wunderlich, K. W. (1973)	functions	grade 10	----
Yamamoto *et al.* (1969)	school-related attitudes (semantic differential)	grades 6-9	factors noted
Yates, D. S. (1972)	topology of the plane	secondary in-service	----
Zoet, C. J. (1973)	rationals, exponents, logarithms	grade 11	----

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